

Second draft

Chap. 1

Contact: CHAPTER ONE

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23 April, 1984

TRANSCENDENTAL NUMBERS

By human standards it could not possibly have been artificial:
It was the size of a world. But it was so oddly and intricately
shaped, so clearly intended for some complex purpose that it could
only have been the expression of an idea. Gliding in polar orbit
about the great blue-white star, it resembled some immense, imperfect
polyhedron, encrusted with millions of bowl-shaped barnacles. Every
bowl was aimed at a particular part of the sky. Every constellation
was being attended to. The polyhedral world had been performing
its enigmatic function for millions of years. It would continue to
~~perform~~ for millions more. It was very patient.

x 10¹⁷
C
C

When they pulled her out, she was not crying at all. Her tiny
brow was wrinkled, her eyes wide. She looked at the bright lights,
the white and green clad figures, the woman lying on the table below
her. Somehow familiar sounds washed over her. On her face was an *odd*
For a newborn --
expression perhaps of puzzlement, or, just possibly, wonder.

* * *

Insert 2A's.

Leaving the monkeys, ~~she was still perched on her father's~~
~~shoulders.~~ ~~They~~ turned a corner and came upon a great spindly-legged,
 long-necked, dappled beast with tiny horns on its head. It towered
 over them. "Their necks are so long, ^{+the talk can't get out"} ~~they never talk,~~" her father
 said. She felt sorry for the poor creature, condemned to silence.
 But she also felt a joy in its existence, a delight that such wonders
 might be.

* * *

There was a lilt in the familiar voice.

"Go ahead, Ellie," her mother gently urged her. [^] "Read it." Her
 mother's sister had not believed that Ellie, ~~at~~ age three, could
 read. The nursery stories, the Aunt was convinced, had been
 memorized. Now they were strolling down State Street on a brisk March
 day and had stopped before a store window. ^{Inside, a burgundy-red stone was glistening in the sunlight.} [^] "Jeweler," Ellie read
 slowly.

Insert, p. 112

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CONTACT

A When she was two years old, she would lift her hands to her father and say, very sweetly, "Dada, up". His friends ~~were amazed~~ ^{*expressed surprise*} at her ~~politeness~~ ^{*apparent precocious*}. "It's not politeness," her father said. "She used to scream when she wanted to be picked up, ~~and~~ ^{*So,*} and once I said to her, 'Ellie, you don't have to scream. Just say "Daddy, up"'. Kids are very bright. ~~All you have to do is~~ ^{*and*} tell them the easiest way to get picked up, ~~they'll~~ ^{*and*} do it."

A *So,* now she was up all right, ^{*and*} at a giddy altitude, perched on her father's shoulders, clutching ^{*for safer*} his thinning hair. Things were so much better up here, ^{*than*} crawling through ~~that~~ ^{*the*} forest of legs down there. Somebody could step on you down there. She ~~clutched~~ ^{*tightened*} her grip. ~~on her father's hair.~~

* * *

She let herself into the spare room a little guiltily. The old Motorola radio was on the shelf where she remembered it. It was very big and heavy ^{hugging it to her chest,} and she almost dropped it. On the back were the words, "Danger. Do ~~Not~~ Remove." But she knew that if it wasn't plugged in, there was no electricity in it. With her tongue between her lips, she removed the screws and exposed the innards. As she suspected, there were no tiny orchestras and miniature announcers quietly living out their small lives in anticipation of the moment when the switch on the front would be clicked to "on." Instead there were beautiful glass tubes, a little like lightbulbs. Some resembled the churches of Moscow she had seen pictured in a book. The prongs at their bases, [✓] were perfectly designed for the receptacles they were fitted into. With the back off and the switch "on," she plugged the set into a nearby wall socket. If she didn't touch it, if she went nowhere near it, how could it hurt her? ✓
↑

After a few moments, tubes began to glow warmly, but no sound came from the radio. It was "broken," and had been retired some years before in favor of a more modern variety. One tube was not glowing. She unplugged the set and pried the malfunctioning tube out

of its receptacle. There was a metallic square inside the bulb, attached to tiny wires. The electricity runs along the wires, she thought vaguely. But first it has to get into the tube. One of the prongs seemed bent, and she was able after a little work to straighten it. Reinserting the tube and plugging the set in again, she was delighted to see it begin to glow, and an ocean of static arose around her. With a start, glancing towards the closed door, she lowered the volume. She turned the dial marked "frequency," and came upon a voice talking excitedly, as far as she could understand, about a Russian machine that was in the sky, endlessly circling the Earth. She turned again, seeking other stations. After a while, fearful of being discovered, she unplugged the set, screwed the back on loosely and, again with difficulty, lifted the radio and placed it ^{back} on the shelf.

As she left the spare room, her Mother came upon her and she started once more. "Is everything all right, Ellie?" "Yes, Mom." She affected a casual air, but her heart was beating, her palms were sweating. She ~~went to~~ ^{settled down in} a favorite spot in the small back yard, ^{and} her knees drawn up to her chin, ~~and~~ thought about the inside of the radio. Are all those tubes really necessary? What would happen if you removed them one at a time? Her father had once called them vacuum tubes. What was happening inside a vacuum tube? Was there really no air in there? How did the music of the orchestras and the voices of the announcers get in the radio? They liked to say, "On the air." Was radio somehow carried by the air? What happens inside the radio set when you change stations? What was "frequency"? Why do you have

to plug it in for it to work? Could you make a kind of map showing how the electricity runs through the radio? Could you take it apart without hurting yourself? Could you put it back together again?

"Ellie, what have you been up to?" ^{asked} ~~said~~ her Mother, walking by with laundry for the clothesline.

"Nothing, Mom. Just thinking."

* * *

-- a life-sized wooden boy ^{who} ~~that~~ ^{magically} ~~became~~ ^{was} roused to life --
wore

For one thing,

The book was better than the movie. ~~There~~ ^{But, in both,} was a lot more in it. ^{And some of} ~~But~~ the pictures were ^{awfully} ~~very~~ different from the movie. Pinocchio ~~had~~ ^{was} a

kind of halter and there seemed to be dowels in his joints. ~~But maybe~~ that's how he looked in the movie also, before he became a real boy?

^{When} ~~There was a moment while~~ Gipetto is just ^{finishing} ~~completing~~ the construction of Pinocchio, ^{he turns} ~~when the carpenter~~, his back ^{on} ~~turned~~ to the puppet, is ^{and} ~~is~~ promptly

~~unaccountably~~ sent flying by a well-placed kick. At that instant, ^{the carpenter's} ~~Gipetto's~~ friend arrives and asks him what he is doing sprawled on the floor. "I am teaching," Gipetto replies with dignity, "the alphabet to the ants."

This seemed to Ellie extremely witty, and she took great pleasure in recounting it to her friends. But each time she quoted it there

was an unspoken question lingering at the edge of her consciousness:

Could you teach the alphabet to the ants? What ^{could} ~~do~~ ants know, anyway?

*Would you want to ~~spend your time~~ Down there with
scuttling, scurrying ^{crawl over your skin, or} creepy insects, who might sting you? or who knows what else?*

* * *

Sometimes she would get up in the middle of the night to go to the bathroom, and find her father there in his pajama bottoms, his neck craned up, a kind of patrician disdain accompanying the shaving cream on his upper lip. Why was he shaving at night, when no one would know if he had a beard? "Because," he smiled, "your mother will know." Years later, she discovered that she had understood this cheerful remark only incompletely. Her parents were in love.

* * *

After school, she had ridden her bicycle to a little park on Lake Mendota. From a saddlebag she produced The Radio Amateur's Handbook

and A Connecticut Yankee in King Arthur's Court, ~~and~~ ^{she} After a moment's consideration, ^e ~~she~~ decided on the latter. Twain's hero had been conked on the head and awakened in Arthurian England. Maybe it was all a dream or a delusion. But maybe it was real. Was it possible to travel backwards in time? Her chin on her knees, she scouted for a favorite passage. It was when Twain's hero is first collected by a man dressed in armor who he takes to be an escapee from a local booby hatch. As they reach the crest of the hill they see a city laid out before them:

[CHECK] "'Bridgeport' ^e ~~said~~ ^{says} I?

'Camelot,' ^{says} ~~said~~ he."

She stared out into the blue lake, trying to imagine a city which could pass as both 19th Century Bridgeport and 6th Century Camelot, when her mother rushed up to her. "I've looked everywhere for you. Why aren't you where I can find you? Oh, Ellie," she whispered, "something awful's happened."

* * *

In the seventh grade they were studying "pi." It was a Greek letter that looked like the architecture at Stonehenge, in England:

two vertical pillars with a crossbar at top -- π . If you measured the circumference of a circle and then divided it by the diameter of the circle, that was pi. At home, Ellie took ~~a compass~~, ^{the top of a mayonnaise jar,} made what ~~looked like a perfect circle~~, wrapped a string around the circle, ~~it~~, straightened the string out and, with a ruler, measured the circle's circumference. She did the same with the diameter, and by long division divided the one number by the other. She got 3.~~14~~²¹. That seemed simple enough.

The next day the teacher, Mr. ~~Dunnigan~~^{Weisbrod}, said that π was about 22/7, about 3.1416. But actually, ^{if you wanted to be exact,} it was a decimal that went on and on forever without repeating the pattern of numbers. Forever, Ellie thought. She raised her hand. It was the beginning of the school year and she had not asked many questions in mathematics class.

"How could anybody know that the decimals go on and on forever?"

"That's just the way it is," said the teacher with some asperity.

"But why? How do you know?" ^{How can you count decimals forever?"}

"Miss Arroway," he was consulting his class list, "this is a stupid question. You're wasting the class's time."

No one had ever called Ellie stupid before, and she found herself bursting into tears. Billy Horstman, who sat next to her, gently reached out and placed his hand over hers. His father had recently been indicted for ^{systematic odometer} ~~tampering with the odometers~~ on the used cars he sold, so Billy was sensitive to public humiliation. Ellie ran out of the class sobbing.

After school, she ^{bicycled} ~~went~~ to the University library to look at books on mathematics. As nearly as she could figure out from what she read, her question ^{wasn't all that} ~~was not~~ stupid. According to the Book of Solomon, the ancient Hebrews had apparently thought that π was exactly equal to three. The Greeks and Romans, who knew lots of things about mathematics, had no idea that the digits in π went on forever without repeating. It had only been discovered about 250 years ago. How was she expected to know if she couldn't ask questions? But Mr. Dunnigan had been right about the first few digits. Pi wasn't 3.14. ²¹ ~~She must~~ ^{Maybe the mayonnaise lid} ~~had been a little squashed, not a perfect circle. Or maybe she'd~~ ~~have drawn the circle carelessly, or~~ ~~been sloppy in measuring the~~ string. ~~But~~ ^{Even} if she ^{had} ~~had~~ been much more careful, ^{though,} they couldn't expect her to measure an infinite number of decimals.

There was another possibility, though. You could calculate pi as accurately as you wanted. If you knew something called calculus, you could prove formulas for π that would let you calculate it as exactly as you wished. The book listed formulas for pi divided by four. Some of them she couldn't ~~even~~ ^{at all.} understand. But there were some that dazzled her. $\pi/4$, the book said, was the same as $1-1/3+1/5-1/7+ \dots$ with the numbers continuing on forever. Quickly she tried to work it out, adding and subtracting the fractions alternately. The sum would bounce from being bigger than $\pi/4$ to being smaller than $\pi/4$, but after a while you could see that this series of numbers was on a bee line for the right answer. You could never get there exactly, but you could get as close as you wanted, if you were able to spend enough time on it, if you were very patient. It seemed to her a miracle that

^{shape}
the geometry of every circle in the world was connected with this
How could circles know about fractions?
series of fractions. ¹ She was determined to learn calculus.

The book said something else. π was called a "transcendental" number. There was no algebraic equation with ordinary numbers in it that could give you π . She had already taught herself a little algebra, and understood what this meant. ~~But~~ ^{And} π wasn't ~~by any means~~ the only transcendental number. In fact there were an infinite ^y ~~number~~ of transcendental numbers. More than that, there were infinitely more transcendental numbers than ordinary numbers, even though π was the only one of them she had ever heard of.

She had caught a glimpse of something majestic. Hiding between all the ordinary numbers was an infinity of transcendental numbers, whose presence you would never have guessed unless you looked deeply into mathematics. Every now and then one of them, like π , would pop up ^{unexpectedly} ~~innocently~~ in everyday life. But most of them -- an infinite number of them, she reminded herself -- were hiding, minding their own business, almost certainly unglimped by the irritable Mr. *Weisbrod*.
~~Dunnigan~~.

She saw through John Staughton from the very first. How her ~~mother~~ ^{never mind that it was} could even contemplate marrying him -- ~~especially~~ only two years after her father's death -- was an impenetrable mystery. He was nice enough looking, and he could pretend, when he put his mind to it, that he really cared about you. But he was a martinet. He made his graduate students come over weekends to weed and garden the new house they had moved into, ~~and~~ ^{he} then made fun of them behind their backs. He told Ellie that she was just beginning high school and was not to look twice at any of his bright young men. He was puffed up with some imaginary self-importance. She was sure that, as a ~~university faculty member~~ ^{professor}, he secretly despised her dead father, who had been only ~~the proprietor of a small store and~~ ^{a shopkeeper and}, when she was very young, a ~~tenant~~ farmer. ~~And very early~~ ^{Staughton had} he made it clear that her interest in radio and electronics was unseemly for a girl, that it would not catch her a husband, that understanding physics was, for her, a foolish and aberrational notion. ^{"Pretentious," he called it. She} If she wished to be a ~~secondary school teacher or a nurse~~ ^{just didn't have the ability. This was an objective fact that} knowing a little science might be ~~she might as well get used to. He was telling her this for her own good. She'd~~ helpful. But he was not prepared, especially as an associate ~~thank him for it in later life. He was, after all, an associate professor of~~ professor of physics, to assist his stepdaughter in making a fool of ~~physics. He knew what it takes. These homiletic lectures would always enrage~~ herself. He assured her of her utter incompetence ~~her, even though she~~ ^{never before -- Staughton's words never believe it --} almost before she ~~herself had ever~~ ^{despite} considered a career in science.

He was not a gentle man, as her father had been, although in the hospital, after her tonsillectomy, he had brought her a splendid kaleidoscope. Still, it was inconceivable that her mother could truly love him. Her father had died, her mother had become increasingly

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distant, she had been exiled to the house of a tyrant, ^{and} she longed to escape.

"'Bridgeport?' ^{says} ~~said~~ I.

'Camelot,' ^{says} ~~said~~ he."

* * *

Don't misinterpret 2 Fl's for pp 2/1 - 2/3.

Second draft

Chap. 2

As they, test's
powers on boys / 10

Second
First Draft

CS

Contact: CHAPTER TWO

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~~23 April, 1984~~

~~EXCHANGED STATES AND~~ COHERENT LIGHT

Surrounding the blue-white star in its equatorial plane was a
vast ring of orbiting debris -- rocks and ice, metals and organics, --

reddish on the periphery and bluish closer to the star.

The world-sized polyhedron plummeted through a gap in the rings and

emerged out the other side. In the ring plane, shadowed by the

irregular jumble of boulders and orbiting mountains, it had been briefly

darkened. But now, carried by its trajectory towards a point above

the opposite pole of the star, the sunlight glistened off its millions

of bowl-shaped appendages. If you looked very carefully you might

have seen one of them make a slight pointing adjustment. But you

could not have seen the burst of radio waves ^{washing out into} ~~emanating from it into~~

the depths of space.

* * *

Quint Star 291-5 p. 1112.

stars

For all ~~of~~ the tenure of humans on Earth, the night sky had been
^{their} a companion and ~~an~~ inspiration. The stars ^{were both} comforted and ^{ing} roused ^{ing} people
~~worldwide~~, in part because they seemed to demonstrate that the heavens
were created for the benefit and instruction of humans. This pathetic
^{worldwide} conceit became the conventional wisdom ^{No culture was free of it.} ~~all over the globe~~. Some
people found in the skies an aperture to the religious sensibility.
Many were awestruck and humbled by the glory and immensity of the

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cosmos. Others were stimulated to the most extravagant flights of fancy. At the very moment that humans discovered the scale of the universe, and found that their most unrestrained fancies were in fact dwarfed by the true dimensions of even the Milky Way Galaxy, they took steps ^{that} to ensure ^{that} their descendants would be unable to see the

stars at all. For a million years, humans had grown up ^{daily knowledge of} ~~knowing~~ intimately the vault of heaven. In the last few thousand years they

began emigrating to the cities. In the last few decades, a major fraction of the human population had abandoned a rustic way of life.

^{But, as a result, the} ~~The~~ cities became polluted and, ~~slowly~~, the nights grew starless. New generations grew to maturity wholly ignorant of the sky that had transfixed their ancestors, and that had stimulated the modern age of science and technology. Without even noticing, just as astronomy began entering a golden age, most people cut themselves off from the sky, a cosmic isolationism that ended only with the dawn of space exploration.

Ellie ^{would} ~~used to~~ look up at Venus and imagine it was a world something like the Earth -- populated by plants and animals and civilizations, but each of them different from the kinds we have here. On the outskirts of ^{town,} ~~Madison, Wisconsin,~~ she would examine the night sky ^{just after sunset} and scrutinize that ^{unflickering} ~~steady~~ bright point of light. ~~She could tell,~~ ^{By comparison} with nearby clouds, ~~that~~ it ^{obvious} ~~was~~ ^{She tried} a little yellow. ~~and try~~ to imagine what was going on there.

She would stand on tiptoe and stare the planet down. Sometimes, she

could almost convince herself that she could see ~~what was happening~~ ^{really see it:} ~~there:~~ A swirl of yellow fog would suddenly clear, and ~~an enormous~~ ^{a vast} jeweled city would briefly be revealed. Air cars sped among the crystal spires. Sometimes she would imagine peering into one of those vehicles and glimpsing one of them. Or she would imagine a young one, glancing up at a bright blue point of light in its sky, standing on tiptoe and wondering ^{about} ~~what~~ the inhabitants of Earth ~~might be like~~. It ^{an irresistible notion:} ~~was a captivating idea:~~ a sultry, tropical planet ^{and} just next door, ~~Venus she had~~ ^{read, is the nearest planet.} brimming over with ^{intelligent} life,

High school was an ordeal. ^{was the hollow shell of} She consented to rote memorization, but knew that it ~~hardly constituted~~ an education. She did the minimum work necessary to do well in her courses, and pursued other ^{matters.} ~~interests.~~ She arranged to spend ~~her~~ free periods, and occasional hours after school, in what was called "shop" -- ^{and cramped dingy, small} a kind of miniature factory, established when the ~~high~~ school ^{spent more effort in} had more major responsibility ^{now,} for vocational education than it did ~~in the middle 1960s.~~ There were lathes, drill presses, and other machine tools which ^{she was forbidden} ~~were almost~~ ^{to approach, because} impossible for her to get near, no matter how capable she might be, ^{still} ~~because~~ she was "a girl." But she was ^{granted} ~~given~~ reluctant permission to pursue her own projects in the electronics area of the "shop." She built radios more or less from scratch, and then went on to something that ~~seemed~~ more interesting.

^{built rudimentary} She designed ~~a simple~~ encrypting machine, ^{that} could take any ^{It} ~~It was rudimentary, but it worked.~~ English language message and transform it by a simple substitution cipher ^{into something that looked like gibberish.} Building a machine that would do the reverse -- converting

an encrypted message into clear ^{when} ~~if~~ you didn't know the substitution convention -- ^{that} ~~was~~ much harder. You could have the machine run through all the ^{possible substitutions} ~~possibilities~~ (A stands for B, A stands for C, A stands for D, . . .) or you could remember that some letters in English were used more often than others. You could get some idea of the frequency of letters by looking at the sizes of the bins for each letter of type in the print shop next door. "ETAOIN SHRDLU," the boys in print shop would say, giving very roughly the order of the 12 most frequently used letters in English. In decoding a long message, the letter that was most common probably stood for an E. Certain consonants tended to go together, she discovered; vowels distributed themselves more or less at random. The most common three-letter word in the language was "the". ^{If} there was a letter standing between a T and an E, it was almost certainly "H." If not, you could bet on "R" or a vowel. She deduced other rules, and spent long hours counting up the frequency of letters in various texts, before she discovered that such frequency tables were published and readily available. Her decrypting machine was only for her own enjoyment. She did not ~~even~~ use it to convey secret messages to her friends. She was ^{unsure to whom} ~~very careful~~ ^{might safely confide these} ~~who she even told about her electronic pursuits:~~ The boys became ^{interested; either jittery or boisterous,} ~~very~~ ^{and a strictly computer} ~~nervous~~, and the girls looked at her ^{in bemusement} ~~strangely~~.

Soldiers of the United States were fighting in a distant place called Viet Nam. Every month, it seemed, more young men were being ^{scooped off the street or the farm and packed off to Viet Nam.} ~~sent there~~. The more she learned about the origins of the war, the more she listened to the public pronouncements of national leaders,

a skeptic on revealed religion,

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While her father had been alive, there was no talk of Bible class. How could ^{her mother} she have married Staughton? The question welled up in her for the thousandth time. Bible class, her mother continued, the more outraged she became. The President and the Congress were

lying and killing, she thought to herself, and almost everyone else was mutely assenting. The fact that her stepfather ~~embraced~~ defended the

official positions ^{on} ~~about~~ treaty obligations, dominoes, and naked

Communist aggression, only strengthened her resolve. She began

attending meetings and rallies at the university nearby. The people

she met there seemed much brighter, friendlier, more alive, than her gray and

lusterless (companions in high school). John Staughton ~~at~~ first cautioned her and

then forbade her to spend time with university students. They would

not respect her, he said. They would take advantage of her. She was

pretending to a sophistication she did not have and never would. ~~Even~~

~~th~~ Her style of dress was deteriorating. Military fatigues were

inappropriate for a girl, and a travesty, a hypocrisy, for someone who

~~claimed she~~ ^{historical} pretended to oppose the heroic, even sacred, mission of the American

~~armed forces.~~ American intervention in Southeast Asia.

Beyond pious exhortations to Ellie and Staughton not to "fight,"

her mother participated little in these discussions. Privately, she

would plead with Ellie to obey her stepfather, to be "nice," ~~and in~~

(in some agitation, ^{to} one day, asked Ellie ~~if she would~~ do something for all

their sakes -- attend Bible class. ~~It~~ would help instill ~~the value~~

~~of~~ the conventional virtues; ~~her mother believed~~; but, even more

important, it would show Staughton that Ellie was willing to make some

accommodation. Out of love and pity for her mother, Ellie acquiesced.

So every Sunday, for most of one school year, Ellie went to a

Bible discussion group at a nearby church. It was one of the

Ellie now suspected Staughton of marrying her mother for her father's life insurance ^{premium} ~~policy~~ -- why else? he certainly showed no signs of loving her -- and was not predisposed to be "nice."

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^{judgment}
and had been inclined to accept her father's remark that the Bible was ^{half} ~~fifty percent~~ barbarism, and ^{half} ~~fifty percent~~ fairy tales.

respectable Protestant denominations, ^{untainted} ~~unsullied~~ by ^{conspicuous} ~~excessive~~ evangelicism.

~~proselytizing~~. There were a few high school students, a number of ^{elderly} adults, mainly women, and the instructor, the Minister's wife. Ellie had never ^{seriously read} ~~studied~~ the Bible before, and ^{so} over the weekend preceding her

first class, ^{she} read through what seemed to her the important parts of

^{trying to keep an open mind.} the Old Testament. She at once recognized that there were two

different and mutually contradictory stories of creation in the first two chapters of Genesis. She did not see how there could be light and

days before the Sun was made, and had trouble figuring out exactly who it was that Cain had married. In the stories of Lot, of Abraham and

^{the betrothal of} Sarah in Egypt, of Dinah, of Jacob and Essau, she found herself

~~increasingly~~ outraged. She understood that cowardice might occur in the real world. And ~~acquiescence~~ ⁱⁿ or even encouragement of the rape of

^{your} one's daughters, deception and fraud of an aged father, ^{committed against} ~~craven~~ consent to the seduction of ^{your} one's wife ^{by a king} by the King. But there was not a word of

protest against these crimes, ^{this} in the supposed holy book. Instead, ~~they~~ ^{the crimes} were at least tacitly approved, and ^{sometimes} in some cases, ^{it} seemed, praised.

When class began, she was eager for a discussion of these ^{inconsistencies,} ~~ambiguities~~, for an unburdening illumination of God's Purpose, or at least for an explanation of why the ^{se crimes} ~~incidents~~ portrayed in these stories were not condemned by the ^{ancient authors} ~~writers~~ or ^{Author.} ~~Writer~~. But she was to be disappointed. The ^{Minister's wife} ~~instructor~~ blandly temporized, and ^{in this} ~~Somehow~~ these stories never surfaced in subsequent discussion. When Ellie inquired how it was possible for the maidservants of the daughter of Pharaoh to

But different gospels gave different ancestors. And they all traced the line through Joseph -- who, nevertheless, they said, wasn't Jesus' father. Why didn't these inconsistencies bother her teacher, or the other students? tell just by looking that the baby in the bullrushes was Hebrew, the

teacher blushed deeply and asked Ellie not to raise unseemly

questions. (The answer dawned on Ellie at that moment.) When they

came to the New Testament, Ellie's agitation only increased. The book attempt^{ed} to trace the ~~prophesied~~ ^{predicted Messianic} ancestral line of Jesus back to David through the lineage of Joseph, who was not Jesus' father, seemed to Ellie a

~~transparent attempt to fit the Isaiahic prophecy after the event~~ ^{This The Flawed genealogy -- cooking the data, it was called in Chemistry Lab.} She

was moved by the Sermon on the Mount, deeply disappointed by the

admonition to render unto Caesar what is Caesar's, and driven to ^{reduced} shouts and tears shouting^{ing} at the instructor ^{twice} ~~sidestepping~~ ^{Ellie's} questions on violent confrontation on the meaning of Jesus' remark. "I bring not

peace but the sword." She told her despairing mother that she had

done her best, but wild horses ^{wouldn't} ~~would not~~ drag her to another Bible

class.

^{Smart #} Ellie, she had half-expected not to attend college, Staughton would not

pay for her to go elsewhere, ^{and} while her mother's meek intercessions

were unavailing. ^{although she} And Ellie was determined to leave home. But she had

done spectacularly well on the standardized college entrance

examinations and found, to her surprise, her teachers telling her that

she was likely to receive scholarships ~~even~~ from well-known

universities. (She had guessed on a number of multiple choice

questions and considered her performance a fluke. If you know ^{very little,} only

enough to exclude all but the two most likely answers, and if you then

guess at ten straight questions, there is one chance in a thousand,

she explained to herself, that you'll get all ten correct. For twenty

straight questions, the odds were one in a million. But something

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CONTACT

Smart, p. 217

She was lying on her bed. It was a hot summer's night.

Elvis was singing, "One night with you, that's what I'm beggin' for". The boys at high school seemed painfully immature, and it was difficult -- especially with her stepfather's strictures and curfews -- to establish much of a relationship with the University young men she met at lectures and rallies. John Staughton was right, she reluctantly admitted to herself, at least about this: the young man, almost without exception, had a penchant for sexual exploitation. ~~But~~ At the same time, they seemed much more vulnerable emotionally than she had expected. Perhaps
1 The one probably caused the other.

like a million kids probably took this test. Someone had to be lucky.)

Cambridge, Massachusetts, seemed far enough away to ^{elude} ~~evade~~ John Staughton's influence, but close enough to return ^{from} to on vacation to visit her mother -- who viewed the arrangement as a ^{difficult} compromise between abandonment ^{ing of} ~~ment by~~ her daughter and ~~some~~ incrementally ^{no} irritation of her husband. Ellie surprised herself by choosing Harvard over the Massachusetts Institute of Technology.

Smart 3 A

She set out to broaden her education, to take as many courses as possible apart from her central interests in mathematics, physics and engineering. ^{More than many others, she} ~~Compared to others she knew, she~~ had ~~not~~ ^{more} been severely encumbered with parental proscriptions, ~~back in Madison, Wisconsin, but~~ ^{than others she knew} her new-found freedom ~~was exhilarating~~ -- intellectually, socially, ^{-- were exhilarating} sexually. At a time when many of her contemporaries were moving towards shapeless clothing that minimized the distinctions between the sexes, she aspired to an elegance and simplicity in dress and makeup that strained her limited budget. There were more effective ways to make political statements, she thought. She cultivated a few close friends and made a number of casual enemies, who disliked her for her dress, for her political and religious views, or for the vigor with which she defended her opinions. Her competence and delight in science were taken as rebukes by many otherwise capable young women. But a few looked on her as ^{what mathematicians call} an existence theorem -- a demonstration ^{sure enough, excel} that women could ~~do well~~ in science -- or even as a role model. At the height of the sexual revolution, she experimented with gradually

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For the hoops they were making her
jump through.

She found it difficult to discuss physics, much less debate it, with her principally male classmates. At first they ^{paid} had a kind of selective inattention to her remarks. There would be a slightly embarrassing pause and then they would go on as if she had not spoken. Occasionally they would acknowledge her remark, even praise it, and then again ^{continue undeflected.} go on as if she had ^{reasonably} never spoken. She was ^{all} sure her remarks were not foolish, and did not wish to be ignored, much less ignored and patronized ^{simultaneously.} both. Part of it she knew

-- but only a part -- ^{a professional voice:} was due to the softness of her voice. So she developed a ~~kind of~~ physics voice, clear, competent and many decibels above her usual

volume. ^{She had to} But with such a voice it was important to be right, otherwise her ^{pick her moments.} credibility would be seriously impaired. And ^{she was in danger of bursting out laughing at them when she wasn't furious at them} it was also hard to continue long in such a voice. So she found herself leaning towards quick, sometimes

cutting, interventions, ^{That was} usually enough to capture their attention; and then she could go on for a while in her ^{a more} usual tone of voice. But ^{again,} Every

time she found herself in a new group she would have to fight her way through ^{The boys had no apparent knowledge that there was even a problem} and just to be able to dip her oar into the discussion. ^{She had to fight} against developing a combative personality or to become altogether a misanthrope. She suddenly caught herself: ^{And certainly} with the knowledge that "misanthrope" referred to is someone who dislikes everybody, not just men. They had a word for someone who hates women ^{But} ~~all right~~: misogynist, the male lexicographers had somehow neglected to coin a word for the dislike of ^{adult males.} the male sex [CHECK:], which she found it increasingly easy to do. And their smug indifference to the power of words.

A book on "The Origin of Man," for example, as if the event could have happened without the origin of woman. And the German language was even worse. She

They were almost entirely men, ^{themselves, she imagined, thought} and they had not ^{imagine} had been unable to ~~contemplate~~ the need a market for such a word.

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H She ~~tried not to become~~
~~would become occasionally irate, but never embittered.~~ After Frederick,
prudent and modest,
her expectations in men were ~~only as high as she dared,~~ but she never
~~entirely lost~~ *the* a sense that love of a much deeper and more subtle variety
was possible, ~~than what she had yet experience.~~

increasing enthusiasm. But she found she was intimidating her would-be lovers. Her relationships tended to last a few months at most. The alternative seemed to be to disguise her interests and stifle her opinions, something she had resolutely refused to do in high school. ~~But~~^The image of her mother, condemned to a resigned and placatory imprisonment, haunted Ellie. She began wondering about men unconnected with the academic and scientific life.

Sumit B

* * *

This is all there is?

[BRIEF MARRIAGE TO FREDERICK]

* * *

In the late 1960s, the Soviet Union succeeded in landing a number of space vehicles on the surface of the planet Venus. They were the first space ^{craft} vehicles of the human species to set down in working order on another planet. About a decade before, American radio astronomers had discovered that Venus was an intense source of radio emission. The most popular explanation had been that the massive atmosphere of Venus trapped the heat through a planetary greenhouse effect. In this view, the surface of the planet was stifling hot, much too hot for crystal cities and a burgeoning biology. Ellie longed for some other explanation, and tried unsuccessfully to imagine ways in which the radio emission could come from high above a clement Venus surface.

Some astronomers over in the Observatory on Garden Street claimed that all the alternatives to a broiling Venus couldn't explain the radio data.

set out to implement a campaign of military thoroughness -- with branched-contingency trees and fallback positions, all to "catch" a desirable man. The word "desireable" was the giveaway, she thought. ^{The poor jerk} ~~He~~ wasn't actually desired, only "desireable" --

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a plausible object of desire in the opinion of ^{those} others on whose account ^{CONTACT} this whole ^{SOTRY} ~~and~~ charade was performed.

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^{it seemed, were}
Some women, she could imagine, [wrapped?] entirely without guile, and bestow^{ed} their affections with hardly a moment's

conscious thought. Others, she perceived, ~~were motivated by~~ ^{with an icy deliberateness at} almost entirely by the thought of "catching" ^a ~~desirable~~ men.

Most women, she thought, were somewhere in the middle,

^{seeking} ~~first~~ to reconcile their passions ^{with} ~~by~~ their ~~consciously~~ ^{apparent} ~~perceived~~ long-term ^{advantage.} ~~interests.~~ Perhaps there ^{were} ~~was~~ occasional ^{communications} ~~contact~~ between love and ^{self-} ~~best~~ interest that ^{escaped the notice} ~~did not trace~~ ^{whole} ~~through~~ the conscious mind. But the ^{In this matter,} ~~idea~~ of calculated

entrapment made her shiver. ~~She~~ ^{was} a devotee of the spontaneous. That was when she met Frederick.

The idea of so massive a greenhouse effect ^{to her} seemed unlikely and, ^{a planet that had let itself go.} somehow, distasteful. But when the Venera spacecraft landed, and in effect stuck out a thermometer, the temperature measured was ~~not~~ ^{high} enough to melt lead. She imagined the crystal cities melting (although Venus wasn't that hot), and the surface awash in silicate tears. *She was a romantic. She knew that years before.*

But at the same time, she had to admire how powerful radio astronomy was. The astronomers had sat home, pointed their radio telescopes at Venus, and measured the surface temperature just about as accurately as the Venera probes did 13 years later. She had been fascinated with electricity and electronics as long as she could remember. But this was the first time she had been deeply impressed by radio astronomy. You stay safely on your own planet and point your *(she marveled once again)* telescope with its associated electronics; information about other worlds then comes fluttering down through the feeds. She decided she would become a radio astronomer.

She began to visit the University's modest radio telescope in nearby Harvard, Massachusetts, and got the staff to let her assist with the observations and the data analysis. She was accepted for a paid summer assistantship at the National Radio Astronomy Observatory in Green Bank, West Virginia, and upon arrival, gazed in some rapture at the display of Grote Reber's original radio telescope, constructed in his back yard in Wheaton, Illinois, in 1938. (Reber had been able to detect the radio emission from the center of the Galaxy only when the diathermy [CHECK] machine down the street was not in operation. *The Galactic Center was much more powerful, but the diathermy machine was a lot closer.*)

The atmosphere of patient ^{inquiry} ~~searching~~, and the occasional rewards of ^{even a modest} discovery were agreeable to her. They were trying to measure how the number of distant extragalactic radio sources increased as they looked deeper into space. She began to think about better ways of detecting faint radio signals. In due course, she graduated cum laude from Harvard and went on for graduate work in radio astronomy at the ^{other end of the country, at the} California Institute of Technology.

For a year, she apprenticed herself to ^{David Drumlin} ~~Drumlin~~. ^{Brilliant, cutting,} ~~Drumlin~~ ^{worldwide} with a reputation for not suffering fools gladly, ^{Drumlin} ~~Drumlin~~ taught Ellie some of the real heart of the subject, and especially its theoretical underpinnings. Said ^{inexplicably} ~~by others~~ to be a charming man with women, Ellie found him intermittently combative and unremittingly self-involved. She was too romantic, he would say. The universe is strictly ordered according to its own rules. The idea is to think as the universe thinks, not to foist our romantic predispositions (and girlish longings, he once said) on the universe. Everything not forbidden by the laws of nature, he assured her -- quoting a colleague down the hall -- is mandatory. ^{Drumlin} ~~Drumlin~~

His idea of a good time was to invite the graduate students and junior faculty ~~that he supervised~~ over for dinner (unlike her stepfather who enjoyed a student entourage, but considered having them to dinner an ^{extravagance} ~~unnecessary excess~~). ^{Drumlin} He would exhibit an extreme intellectual territoriality, steering the conversation to topics in which he was the acknowledged expert, and then swiftly dispatching contrary opinions. After dinner he would often subject them to a

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Insent, ^L p. 2/11.

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CONTACT

(U, P)

She gazed at him as he lectured, trying to divine this odd combination of personality traits. She saw a man in excellent physical condition:

~~Description of David Drumlin:~~ ^{moon} Grey hair, sardonic smile,

half reading glasses perched toward the end of his nose,

a bow tie, a ^{square jaw} ~~slight double chin~~, and remnants of a Montana twang.

slide show of perhaps ^{fifty} ~~a hundred~~ images of Dr. X ^{D. scuba diving in Cozumel,} ~~skiing in Colorado or~~
~~or Tobago or the Great Barrier Reef. Even in the underwater images he was~~
~~Utah or the high Sierras, generally smiling into the camera and~~

waving. Sometimes there would be an additional set of ~~perhaps a dozen~~
~~slides showing him skiing with the lovely Dr. Helga Bork.~~ ^{under water his colleague, (Drumlin's}
~~His wife~~ ^{reasonable}
 would always object to these ~~particular~~ slides, on the grounds that

the audience had already seen them. But the audience had already seen
 them all. ^{Drumlin} ~~He~~ would then extol the virtues of the athletic Dr. Bork,
 and his wife's humiliation increased.) Many of the students gamely

went along, seeking new vistas that they might previously have missed
~~among the brain corals and the tooth fish spiny sea urchins.~~
~~on the images of the alpine slopes.~~ A few would writhe in
 embarrassment, ~~or stand to disguise their impatience.~~ ^{become absorbed in the avocado dip}

A stimulating afternoon for his graduate students would be for

them to be invited over, in two's or three's, to ^{drive him to the edge of} ~~pilot his motorboat~~
~~a favorite cliff near Pacific Palisades. Casually attached to his hang~~
~~on a laguna 45 minutes away, so that he~~ ^{initially tethered behind}
~~glider, he would leap off the precipice towards the tranquil Pacific ocean a few hundred~~
~~feet below. Their job was to drive down the coast road and retrieve him. He would swoop~~
~~down when he dared, beaming exultantly. He would invite others to~~ ^{were invited to}

join him, but few accepted: He had, and delighted in, the competitive
~~For a man in his fifties, it was quite a performance.~~ ^{Small P}
 advantage. He never made a pass at her, but, she was certain, he was
 bound to try.

Peter Valerian

In her second year at Cal Tech, X₂ returned to campus from his
 sabbatical year abroad. He was a gentle and unprepossessing man. No
 one, least of all himself, considered him especially brilliant. Yet
 he had a steady record of significant accomplishment in radio
 astronomy because, ^{when pressed} he "kept at it." There was one
 slightly disreputable aspect of his scientific career, however: he

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, but was at heart one of those men one finds at the top of every profession who are in a constant state of anxiety that someone, somewhere, might prove smarter than they.

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Others looked on graduate students as resources for the future, as the carriers of their intellectual torches to the next generation. But Drumlin, she felt, had quite a different view: for him, graduate students were gunslingers who might at any moment successfully challenge him for the reigning title of "Fastest Gun in the West."

was fascinated by the possibility of extraterrestrial intelligence. Each faculty member, it seemed, was allowed one foible: ^{Drumlin} X had hang-gliding and ^{Valerian} X had life on other worlds. Others had topless bars, or ^{something called} raising orchids, or ^{Valerian} Transcendental Meditation. ^{Valerian} X had thought about ~~the subject of~~ extraterrestrial intelligence (ETI) longer and harder -- and in many cases more carefully -- than anyone else. As she grew to know him better, she realized that ETI provided a fascination, a romance, that was in dramatic contrast with the humdrum business of his personal life. This thinking about the search for extraterrestrial intelligence was not work for him, but play. His imagination soared.

Ellie loved to listen to him. It was like, ~~she thought~~, entering Wonderland or the Emerald City. Actually, it was better, because at the end of all his ruminations, there was the thought that maybe this could really be true, could really happen. Someday, she mused, there might in fact and not just in fantasy be a message received by one of the great radio telescopes. But in a way it was worse, because ~~he~~ ^{Valerian}, like ^{Drumlin on other subjects, repeatedly stressed} ~~he~~ in a different context, kept stressing that ~~the~~ speculation ^{must be confronted with} ~~had to be tempered by~~ sober physical reality. The extraterrestrials

and their technology had to conform strictly to the laws of nature, a fact that severely crimped many a charming ^{prospect} ~~possibility~~. But what emerged from this sieve, what survived the most skeptical physical and astronomical analysis, might even be true. You couldn't be sure, of course. There were bound to be possibilities that you missed, and that people cleverer than you would one day figure out.

It was a kind of sieve that separated the rare useful speculation from torrents of nonsense.

And separately evolved on very different worlds, different they would have to be.

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Valerian

time and our

X would emphasize how we are trapped by our culture and our biology, how limited we are, ^{by definition,} in imagining creatures or civilizations.

fundamentally different from us and ours. It was ~~certainly~~ possible that beings much more advanced than we might have unimaginable technologies -- this was, in fact, almost guaranteed -- and even new laws of physics. It was hopelessly narrowminded, he would say as they walked past a succession of stucco California arches as in a DiCherico painting, to imagine that all significant laws of physics had been discovered at the moment our generation began contemplating the problem. There would be a 21st Century physics, ~~he went on,~~ and a 22nd Century physics, and a Fourth Millenium physics. We might be laughably far off in ^{guessing} ~~trying to figure out~~ how a very different technical civilization would communicate.

But then, he always reassured himself, the extraterrestrials would have to know how backward we were. If we were any more advanced, they would know about us already. Here we were, just beginning to stand up on our two feet, discovering fire last Wednesday, only yesterday stumbling on Newtonian dynamics, Maxwell's Equations, Grand Unified Theories, and radio telescopes. ^{Valerian} X was sure they wouldn't make it ^{too} hard. They would try to make it easy. If they wanted to communicate with dummies, they would have to make allowances for the dummies. That's why, he thought, we'd have a fighting chance. His lack of brilliance was in fact his strength. He knew, he was confident, what dummies knew.

As a topic for her doctoral thesis she chose, with the concurrence of the faculty, the development of an improvement in the sensitive receivers employed on radio telescopes. It made use of her talents in electronics, freed her from the mainly theoretical ~~X~~, and permitted her to continue her discussions with ~~X~~ without taking the professionally dangerous step of working with him on the highly speculative subject ^a of extraterrestrial intelligence for a ^{Drumlin, Valerian -- but} doctoral dissertation. Her stepfather had taken to denouncing her interests ^{or occasionally, as} alternately as unrealistically ambitious, ^{and} deadeningly trivial. When he heard of her thesis topic through the grapevine (by now, she was not talking to him at all) he dismissed it as pedestrian. ✓

She was working on the ruby maser. A ruby is made mainly of alumina, which is almost perfectly transparent. The red color ^{Derives} is from a small impurity of chromium distributed through the alumina crystal. When a strong magnetic field is impressed on the ruby, the chromium atoms increase their energy, ^{or, as physicists like to say,} and are raised to an excited state. She loved the image of all the little chromium atoms called to feverish activity in each amplifier, frenzied in a ^{practical} good cause -- amplifying a weak radio signal. The stronger the magnetic field, the more excited the chromium atoms ^a became. Thus the maser could be tuned, so that it was particularly sensitive to a selected radio frequency. She found a way to make rubies with lanthanide impurities in addition to the chromium atoms, so a maser could be tuned to a narrower frequency range and could detect a much weaker signal than previous masers. She then installed her new instrument on one of Cal Tech's radio

telescopes, and detected, at entirely new frequencies, what astronomers call the three degree black body background radiation -- the remnant, in the radio spectrum, of the immense explosion that began this universe, the Big Bang.

"Let's see if ^{I've got} ~~I have~~ this right," she would say to herself.

"I've taken an inert gas that's in the air, made it into a liquid, put some impurities into a ruby, attached a magnet, and detected the fires of creation." She would then shake her head in amazement. To anyone

ignorant of the underlying physics, it ^{might} ~~seemed~~ the most ~~arrant~~ ^{arrogant and} ~~pretentious~~ necromancy. How would you explain this to the best scientists of a thousand years ago, who knew about air and rubies and lodestones, but not about liquid helium, and stimulated emission, and superconducting flux pumps? In fact, she reminded herself, they did not have even the foggiest idea about the radio spectrum. Or the idea of a spectrum. Or the notion that light was waves. How could we hope to understand the science of a civilization a thousand years ahead of us?

It was necessary to make rubies in large batches. Only a few would have the requisite properties. ^{None approached} ~~The remainder were far from~~ gemstone quality, ^{and} ~~Most~~ were tiny. But she took to wearing a few of ^{larger} the remnants. They matched her dark coloring well. Even when carefully cut, you would immediately recognize some anomaly in the stone set in a ring or a brooch: the odd way, for example, that it caught the light at certain angles from an abrupt internal reflection, or a ^{blemish} ~~kind of~~ peach-colored ~~patchiness~~ inside the ruby red. She would explain it to non-scientist friends by saying that she liked rubies

but couldn't afford them. It was a little bit like the scientist who first discovered the biochemical pathway of green plant photosynthesis, and forever after wore a sprig of pine needles or a piece of parsley in his lapel. Colleagues, their respect for her rapidly growing, considered it ~~another of her idiosyncracies.~~ ^{one of her more minor}

* * *

Paul Ganguin sailed to Tahiti:

The great radio telescopes of the world are constructed in remote locations for ~~a~~ ^{the same} good reason. For them to work well, they must be distant from the ~~radio~~ pollution produced by ~~our~~ civilization. As civilian and military radio traffic has increased, radio telescopes have had to hide in increasingly remote locations -- sequestered in an obscure valley in Puerto Rico, say, or exiled to a vast scrub desert in New Mexico ^{or Uzbekistan.} If radio interference continues to grow, as is virtually inevitable, it will make increasing sense to build the telescopes off the Earth altogether. The scientists who work at these isolated observatories tend to be dogged and determined. Spouses abandon them, children leave home at the ~~earliest possible moment.~~ ^{drop of a hat, as people used to say when they all wore hats.}

But the astronomers stick it out. Rarely do they think of themselves as ~~romantics.~~ ^{dreamers. The permanent scientific staff} Full-time astronomers in remote observatories tend to be the practical ~~scientists.~~ ^{ones} the experimentalists, the ~~ones~~ ^{experts} who know a great deal about antenna design and data analysis, and ~~very little~~ ^{quite a bit less}

about quasars or pulsars. Generally speaking, they had not dreamed of the stars in ~~their~~ childhoods: They were too busy repairing the carburetor in the family car.

After receiving her doctorate, Ellie accepted an appointment as research associate at the Arecibo Observatory, a bowl of wire that ^{Covers} ~~lines~~ the floor of a karst valley in the foothills of northwestern Puerto Rico. With the largest radiotelescope on the planet, she was eager to employ her maser detector to look at as many different astronomical objects as she could -- nearby planets and stars, the center of the Galaxy, pulsars and quasars. As a full-time member of the Observatory staff, she would be assigned a significant amount of observing time. Access to the great radio telescopes is keenly competitive, there being many more worthwhile research projects than can possibly be accomodated. So reserving telescope time for the resident staff is a perquisite beyond price. For many of the astronomers, it was the only reason they would consent to live in such

✓ God-forsaken places.

She also hoped to examine a few nearby stars for possible signals of intelligent origin. With her detector system it would be possible to hear the radio leakage from a planet like Earth even if it were a few light years away. And an advanced society, intending to communicate with us, would doubtless be capable of much greater power transmissions than we were. If Arecibo, used as a radar telescope, was capable of transmitting one megawatt of power to a specific locale in space, then a civilization only a little bit in advance of ours

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The resources that had been devoted to this question were trifling, she thought. She was hard-pressed to name a more important scientific problem.

might, she thought, be capable of a hundred megawatts or more. If they were intentionally transmitting to the Earth with a telescope as powerful as Arecibo but with a 100 megawatt transmitter, an Arecibo should be able to detect them virtually anywhere in the Milky Way Galaxy. When she thought carefully about it, she was surprised that human technological capability in the search for extraterrestrial intelligence was so far behind what had actually been attempted.

The Arecibo facility was known to the locals as "El Radar." Its function was generally obscure, but it provided more than a hundred badly needed jobs. Except for purposes of marriage, the young women were fiercely sequestered from the young male astronomers, some of whom who could be viewed at almost any time of the day or night jogging along the circumferential track that surrounded the 1,000-foot diameter dish. As a result, the attentions directed at Ellie upon her arrival, while not entirely soon became unwelcome, were a distraction from her research.

The physical beauty of the place was considerable. At twilight, she would look out the control windows and see storm clouds hovering over the other lip of the valley, just beyond one of the three immense pylons that supported the feed horns and her newly installed maser system. From which were suspended. At the top of each pylon, a red light would gleam, to warn off any airplanes that had improbably strayed upon this remote vista. At 4 A.M., she would step outside for a breath of air, and hear the puzzle to understand a massed chorus of thousands of local land frogs, called "kowis" [CHECK] in imitation of their plaintive cry.

Some astronomers lived near the Observatory, but the isolation -- compounded by ignorance of Spanish and inexperience with any other culture -- tended to drive ^{+ them and} their wives toward racism and madness. Some had decided to live at Rainey Air Force Base, which boasted the only English-speaking school in the vicinity. But ^{+ he} ~~it was a~~ 90-minute drive ^{only}, heightening their sense of isolation ~~from the Observatory and its community~~. Repeated threats by Puerto Rican separatists, convinced erroneously that the Observatory played some significant military function, increased the sense of subdued hysteria, of circumstances barely under control.

Many months later, ^{Valerian} ~~he~~ had come to visit. Nominally, he was there to give a lecture, but she knew that part of his purpose was to check up on how she was doing, and provide some semblance of psychological support. But her research had gone very well. She had discovered what seemed to be a new molecular cloud complex, and had obtained some very fine high time-resolution data on the timing of the pulsar at the center of the Crab Nebula. [vis. from Arecibo? CHECK.] She had even performed the most sensitive search yet performed for signals from a few dozen nearby stars, but without ^{no} ~~any~~ positive results. There had been one or two suspicious regularities. She observed the stars in question again, and could not find anything out of the ordinary. Look at enough stars, and, sooner or later, terrestrial interference or the concatenation of random noise will produce a pattern that, for a moment, ^{makes your heart palpitate. You calm down and} ~~looks very exciting. You always have to~~ check it out. If it doesn't repeat itself, consider it spurious: This ~~was a rule she had~~ ^{was}

*essential if she was
learned*

~~taught herself~~, to preserve some emotional equilibrium in the face of what she was seeking. She was ~~molding a set of attitudes as~~ *determined to be as* tough-minded as possible, without abandoning the sense of wonder that was driving her in the first place.

From her scant supply in the community refrigerator, she had made a rudimentary picnic lunch, and they sat themselves down at the very periphery of the bowl-shaped dish. Workmen repairing or replacing the panels could be seen in the distance, walking on special snowshoes so they did not tear the wire mesh and plunge through to the ground below. *Valerian* He was delighted with her progress. They exchanged bits of gossip, and ~~traded~~ *current* scientific tidbits. The conversation turned to SETI, as the search for extraterrestrial intelligence was beginning to be called. "Have you ever thought about doing it full time, Ellie?" he asked.

"I haven't really thought about it much. But ~~is it even~~ *is it?* ~~it's not really~~ possible, There ~~isn't any serious facility devoted to SETI full-time,~~ *no major* ~~is there?~~ *anywhere in the world, as far as I know.*"

"No, but there might be. There's a chance that hundreds of additional dishes might be added to the Very Large Array, and make it into a dedicated SETI observatory. They'd do the usual kind of radio astronomy also, of course. It would be a superb interferometer. It's only a possibility, it's expensive, it needs real political will, and it's years away at best. Just something to think about."

Peter,
"Look, ~~Mr.~~ I've just examined some 40-odd nearby stars of roughly solar spectral type. I've looked in the 21 centimeter hydrogen line,

which everybody says is the obvious beacon frequency -- hydrogen, the most abundant atom in the universe, and so on. And I've done it with the highest sensitivity every tried. There's not a hint of a signal. Maybe there's no one out there. Maybe the whole ~~idea~~^{business} is a waste of time."

"Like life on Venus? That's just disillusionment talking. Venus is a hellhole of a world; it's just one planet. ^{But} There's hundreds of billions of stars in the Galaxy. You've looked at only a handful. Wouldn't you say it's a little premature to ~~think you've done one~~^{give up? You've done one} ~~like a thorough search?~~^{like a billionth of the problem. Probably much less than that, if you consider other frequencies.}"

"I know, I know. But don't you have the sense that if they're anywhere, they're everywhere? If really advanced guys live a thousand light years away shouldn't they have an outpost in our back yard? You could do the SETI thing forever, you know, and never convince yourself that you'd completed the search."

^{Dave Drumbin.}
"Oh, you're beginning to sound like ~~he~~. If we can't find them in his lifetime, he's not interested. We're just beginning SETI. You know how many possibilities there are. This is the time to leave every option open. This is the time to be optimistic. If we lived in any previous time in human history, we could wonder about this all our ~~lives~~^{to no effect.} ~~But we~~^{But this time is unique.} couldn't do a thing to find ~~out~~ the answer. This is the first time when anybody's been able to look for extraterrestrial intelligence. ~~You have~~^{You've made} the detector to look for civilizations on the planets of millions of other stars. Nobody's guaranteeing success. But can you think of a more important question? Imagine them out

there, sending us signals, and nobody on Earth is listening. That would be a joke, a travesty. Wouldn't you be ashamed of your civilization if we could listen, and ~~decided not to?~~ *didn't have the fortitude to do so?"*

* * *

Two hundred-fifty-six images of the left world swam by on the left. ~~The same number of~~ *Two hundred-fifty-six images* ~~images of the right world moved~~ *slided* by on the right. He integrated all 512 images into a wraparound view of his surroundings. He was deep in a forest of great *waving* blades, some green, some etiolated, almost all larger than he. But he had no difficulty clambering up and over, occasionally balancing precariously on a bent blade, falling to the gentle cushion of horizontal blades below, and then continuing, unerringly, on his journey. He could tell he was centered on the trail. It was ~~excitingly~~ *tantalizingly* fresh. He would think nothing, if that's where the trail led, of scaling an obstacle a hundred or a thousand times as tall as he was. He needed no pylons [CHECK], no ropes. He was already equipped. The ~~blades~~ *ground* immediately before him were redolent with a marker odor left very recently, it must be, by another scout of his clan. It would lead to food; it almost always did. The food would spontaneously appear. Scouts would find it and mark the trail. He and his fellows would bring it back. Sometimes the food was a creature rather like himself; other times,

it was just an amorphous or crystalline lump. Occasionally it was so large that many of his clan would be required, working together, ^{and shoving} heaving ~~it~~ over the folded blades, to carry it home. He smacked his mandibles in anticipation.

* * *

"What worries me the most," she continued, "is the opposite, the possibility that they're not ~~even~~ trying. They could communicate with us, all right, but they're not doing it because they don't see any point to it. It's like," she ~~said,~~ ^{glanced} looking down ~~near~~ ^{at} the edge of the tablecloth ^{they} ~~she~~ had spread over the grass, "like the ants. They ~~even~~ occupy the same landscape that we do. They have plenty to do, things to occupy themselves. On some level they're aware of their environment very well. But we don't try to communicate with them.

^{5.} And I don't think they have the foggiest notion that we exist ~~at all~~." ^{A large more enterprising than his fellows,}
 ♪ ~~One more valiant ant,~~ ^{had} ventured onto the tablecloth and was briskly marching along the diagonal of one of the red and white squares. Suppressing a slight ^{twinge} ~~feeling~~ of repugnance, she gingerly flicked it back onto the grass, -- ^{to} where it belonged.

Second draft

Chap. 3

LENOV Telegraph

Second
First Draft

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Contact: CHAPTER THREE

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~~23 April, 1984~~

WHITE NOISE

The pulses had been ^{journeying} ~~voyaging~~ for years through the great dark between the stars. Occasionally, they would intercept an irregular cloud of gas and dust, and a little of the energy would be absorbed or scattered ~~into a new direction. But almost all of the energy~~ ^{The remainder} continued in the original direction. Had you been riding along with the train of waves, you would have noticed a faint yellow ~~source of~~ light up ahead, slowly growing in brightness among ~~all the other~~ ^{unvarying} ~~sources of light whose brightness was unchanging.~~ ^{unchanging} Now, although still a point, it was by far the brightest object in the ^{black} sky, ~~and the~~ waves were encountering a horde of giant snowballs.

Entering the ~~Project~~ ^{administration} Argus ~~control~~ building was a willowy woman in her late 30's. Her eyes were large and far apart, and served to soften the angular bone structure of her face. Her long dark hair was loosely gathered by a tortoise barrette at the nape of her neck. Casually dressed in a knit T-shirt and khaki skirt, she strolled along a hallway on the first floor, and entered a door marked "E. Arroway, Director." As she removed her thumb from the fingerprint ^{dead} ~~door~~ lock, an observer might have noticed a ring on her right hand with an oddly ^{unprofessionally} milky red stone set in it. Turning on only a desk lamp, she rummaged through a drawer, finally producing a pair of earphones. Briefly

illuminated on the wall beside her desk was a quotation from the "Parables" of Franz Kafka: "Now the Sirens have a still more fatal weapon than their song, namely their silence . . . Someone might possibly have escaped from their singing; but from their silence, certainly never:" Extinguishing the light with a wave of her hand, ~~in~~ in the semi-darkness she made for the door,

Shirley:
please indent
and box this
quote.
also single
space it.

In the control room, she quickly reassured herself that all was in order. Through the window she could see a few of the ~~thousand hundred thirty~~ 131 radio telescopes that stretched for tens of kilometers across the New Mexico scrub desert, like some strange species of mechanical flower~~s~~ straining towards the sky. It was early afternoon and she had been up ~~very~~ late the night before. Radio astronomy can be performed during daylight, because the sky does not scatter radio waves from the Sun as it does ordinary visible light. To a radio telescope pointing anywhere but very close to the Sun, the sky is pitch black. Beyond the Earth's atmosphere, on the other side of the sky, ~~however~~, is a universe teeming with radio emission. By studying radio waves you ~~can~~ could learn about planets and stars and galaxies, about the composition of great clouds of organic molecules that drift between the stars, about the origin and evolution and fate of the universe. But all these radio emissions were natural -- caused by physical processes, electrons spiraling in the galactic magnetic field, say, or interstellar molecules colliding with one another, or the remote echoes of the Big Bang red-shifted from gamma rays at the origin of the universe to the ~~tame~~ feeble, chill and ~~cool~~ radio waves that fill all of space in our epoch.

in which

But in the scant few decades ~~that~~ humans had pursued radio astronomy, there had never been a real signal from the depths of space, something manufactured, artificial, contrived by an alien mind. There had been false alarms. The regular time variation of the radio emission from quasars and, especially, pulsars had at first ~~tentatively, fromulously,~~ been thought, ~~tantalizingly,~~ to be a kind of announcement signal from someone else, or perhaps a radio navigation beacon for exotic ships that plied the spaces between the stars. But they had turned out to be something else -- equally exotic, ~~perhaps,~~ ^{depending on your perspective,} as a signal from other beings in the dark of the night sky. Quasars seemed to be stupendous sources of energy, ~~most~~ ^{many} of them observed more than half-way back to the origin of the universe. Pulsars ~~were~~ ^{are rapidly spinning} atomic nuclei the size of a city. There had ~~been~~ ^{also other} rich and mysterious messages, all right, ~~and that~~

~~they~~ had turned out to be intelligent after a fashion, but not very extraterrestrial. The skies ~~now abounded with~~ ^{were now peppered} ~~classified~~ ^{secret} military

radar systems and radio communication satellites. ~~that were beyond the~~ ^{entirely} ~~of a few civilian radio astronomers and sometimes~~ ^{outlaws, ignoring international} ~~such a commonplace~~ ^{and} And yet, the origin of life now appeared to be ~~so easy~~ ^{so easy} -- there

were so many planetary systems, and so many worlds with billions of years available for biological evolution -- that it was hard to believe that the Galaxy was not teeming with life and intelligence. Project Argus was the largest facility in the world mainly dedicated to the radio search for extraterrestrial intelligence. Radio waves traveled with the speed of light, faster than which nothing, it seemed, could go. They were easy to generate and easy to detect. Even very ~~simple~~ ^{backward} technological civilizations, like that on Earth,

telecommunications agreements. There ~~was~~ ^{were} no recourses and no ~~enforcement~~ ^{penalties}. Occasionally, all ~~no~~ ^{denied} nations ~~acknowledged~~ ^{responsibility} for a spurious ^{nearby} signal.

would stumble on radio fairly early in their exploration of the physical world. Even with the rudimentary radio technology ~~now on~~ ^{now,} ~~Earth~~ ^{available} -- only a few decades after the invention of the radio telescope -- you could communicate with an identical civilization halfway to the center of the Galaxy, ~~if they were no smarter than we are.~~ ✓ But there were so many places in the sky to examine, so many frequencies on which an alien civilization might be broadcasting, that it required a systematic and patient observational ^{ing} program. Argus had been in full operation for ^{more than} ~~over~~ four years. There had been a number of glitches, bogies, intimations, false alarms. But no message.

"Afternoon, Dr. Arroway." ^The lone engineer smiled pleasantly at her. She nodded back a little distractedly. All ¹³¹ ~~thousand~~ telescopes of Project Argus were controlled by computers. The system slowly scanned the sky on its own, checking that there were no mechanical or electronic breakdowns, comparing the data from different elements of the array of telescopes. She glanced at the billion-channel ~~frequency~~ analyzer, a bank of electronics covering a whole wall, and at the visual display of the autocorrelator.

There was not really very much for the astronomers and technicians to do as the telescope array, slowly scanned the sky over the years, ^{*} If it detected something of interest, it would automatically sound an alarm, and alert project scientists in their

beds at night if need be. Then ^{Arroway} ~~she~~ would go into high gear, to determine if ^{this one} ~~it~~ was an instrumental failure or some American or Soviet space bogey. Together with the engineering staff, she would devise ways of improving the sensitivity of the equipment. They would delegate some of the radio telescopes to examine exotic astronomical objects that had been recently detected by other observatories. Was there any pattern, any regularity in the emission? She would help staff members and visitors with projects unrelated to SETI, ~~she would~~ ^{and} fly to Washington to keep interest at the funding agency, the National Science Foundation, high. She would give a few public talks on Project Argus -- at the Rotary Club in Socorro, or the University in Albuquerque -- and occasionally ^{greet} ~~host~~ an enterprising reporter who would arrive, sometimes unannounced, in remotest New Mexico.

She had to take care that the tedium did not ~~wash over her,~~ engulf her. Her coworkers were pleasant enough, but -- even apart from the question of the impropriety of a close personal relationship with a nominal subordinate -- she did not find herself tempted to any real intimacies. There had been a few brief, torrid but fundamentally casual relationships with local men unconnected with the Argus project. But in this area of her life, too, a kind of ennui, a lassitude, had settled over her.

She sat herself down before one of the consoles and plugged the earphones in. It was futile, she knew, a small conceit, to think that she, listening to one or two channels, could detect a pattern when the vast computer system, monitoring a billion channels, could not. But

it gave her a modest illusion of utility. She leaned back, eyes half-closed, an almost dreamy expression enveloping the contours of her face. She's really quite lovely, the technician permitted himself to think.

She heard, as always, a kind of static, an echoing and continuous random noise. Once, when listening to a part of the sky that included the star AD 0000000 [CHECK] in Cassiopeia, she felt she heard a kind of singing, fading tantalizingly in and out, lying just beyond her ability to convince herself that there was something really there. This was the star towards which the Voyager 1 spacecraft, now in the vicinity of the orbit of Neptune, would ultimately travel -- the spacecraft itself carrying a golden phonograph record on which were impressed greetings ^{pictures} and songs from Earth. Could they be sending us their music at the speed of light, while we are sending ours at one ^{ten}-thousandth that speed? At other times, like now, when the static was clearly patternless, she would remind herself of Shannon's famous dictum in information theory, that the most efficiently coded message was indistinguishable from noise, unless you had the key to the encoding beforehand. Rapidly, she pressed a few keys on the keyboard ~~built into the console~~ before her, and played two of the narrow-band frequencies ~~off~~ against each other, one in each earphone. Nothing. She tried to listen to the two planes of polarization of the radio waves, and then to the contrast between linear and circular polarization. There were ~~more than~~ a billion channels to choose from. You could spend your life trying to ^{outguess} ~~preempt~~ the computer, listening with very limited human ears and brains, seeking a pattern.

Humans are good, she knew, at discerning subtle patterns that are really there, but ^{equally so} ~~also~~ at imagining them when they are altogether absent. There would always be some sequence of pulses, some configuration of the static, that would for an instant give a syncopated beat, or ~~even~~ a brief melody. She switched to a pair of radio telescopes that were listening to ~~a coherent~~ ^{an exotic} galactic radio source. She heard a glissando, down the radio frequencies, a "whistler" due to the scattering of radio waves by electrons in the tenuous interstellar gas between the ~~radio~~ source and the Earth. [CHECK] The more pronounced the glissando, the more electrons in the way, and the further the source was from the Earth. [CHECK] She had done this so often that she was able, just from hearing a radio whistler for the first time, to make an accurate judgment of its distance. This one, she estimated, was about a thousand light years away -- well beyond the local neighborhood of stars, but ~~still~~ well within the great Milky Way Galaxy.

Ellie returned to the sky survey mode ~~of Project Argus~~. Again, no pattern. It was like a musician listening to the rumble of a distant thunderstorm. The occasional ^{small} ~~little~~ patches of pattern in the ~~static~~ would pursue her, intrude themselves into her memory with such insistence that sometimes she was forced to go back to the tapes of a particular observing run, and see if there was something that she had ~~missed, something the computers had not caught.~~ ^{something her unconscious mind had caught, and the computers missed.}

All her life, dreams had been her friends. Her dreams were unusually detailed, well-structured, colorful. She was able to look closely at her father's face, say, or the back of an old radio set,

and the dream would oblige with full visual details. ~~All her life,~~
^{always} She had ^{always} been able to recall her dreams, down to the fine ^{details} ~~nuances~~ --
 except for the times when she had been under extreme pressure, as
 before her Ph.D. oral exam, or when she and Frederick ^{were breaking up.} ~~decided that~~
~~marriage no longer made sense for them.~~ But now she was having
 difficulty recalling the images in her dreams. And ^{disconcertingly,} ~~at the same time~~
 she began to dream sounds -- as people ^{do} ~~who~~ are blind from birth. ~~do.~~
 In the early morning hours, her unconscious mind would generate an
 occasional theme or ditty, a tune ~~that~~ she had never heard before.
 She would wake up, give an audible command to the light on her night
 table, pick up the ~~ball point~~ pen she had ^{put} ~~placed~~ there for the
 purpose, draw a staff and commit the music to paper. Sometimes, after
 a long day, she would play it on her recorder and wonder if she had
 heard it in Ophiuchus or Capricorn. She was, she would admit to
 herself ruefully, being haunted by the electrons and the moving holes
 that inhabit receivers and amplifiers, and by the charged particles
 and ~~the~~ magnetic fields of the cold, thin gas between ~~and around~~ the
 flickering, distant stars. ✓

It was a repeated single note, high-pitched, and ~~a little~~
^{around the edges} raucous. It took her a moment to recognize it. But ~~then~~ she was
 quite sure she hadn't heard it in 35 years. It was the metal pulley
 on ~~her mother's~~ ^{the} clothesline that would ^{complain} ~~protest~~ each time her mother
~~would pull the line~~ ^{and gave a tug} and put out another freshly washed smock to dry in
 the Sun. As a little girl, she had loved ~~to watch~~ ^{and,} the army of marching
 clothespins; ^{and,} when no one was around, ~~she~~ would bury her face in the

^{at once sweet and pungent,}
newly dried sheets. The smell, ^{somehow} ~~somehow~~ enchanted her. Could that be a whiff of it now? She could remember herself laughing, ~~and~~ ^{when} toddling away from the sheets, ^{as} ~~as~~ her mother swooped her up -- to the sky it seemed -- ^{in one graceful motion,} and carried her away ~~from the clothesline~~ in the crook of her arm, as if she, herself, were just a little bundle of clothes to be neatly arranged in the chest of drawers in her parents' bedroom. ✓

"Dr. Arroway? Dr. Arroway?" The technician looked down on her ^{fluttering eyelids} ~~closed eyes~~ and shallow breathing. She blinked twice, removed the headphones, and ^{gave him} ~~looked up with~~ a small apologetic smile. Sometimes her colleagues ~~discovered that they~~ had to talk very loudly if they wished to be heard above the amplified cosmic radio noise. She would in turn compensate for the volume of the noise -- she was loath to remove the earphones even in brief conversations -- by shouting back. When she was sufficiently preoccupied, a casual or even convivial exchange of pleasantries would, to an inexperienced observer, seem like a fragment of a fierce ^{and unprovoked} ~~argument~~ unexpectedly generated amidst the quiet of the immense radio facility. But now she only said, "Sorry. I must have drifted off."

^{Drumlin}
"It's Dr. ~~X~~ on the phone. He's in Jack's office and says he has an appointment with you."

^{Drumlin}
~~X~~ was approaching retirement age now. His brilliance had remained undiminished, but there were a number of personal

idiosyncracies that had not been ^{in evidence} ~~present~~ when she had ^{served,} ~~been~~, briefly, as his graduate student at Cal Tech. For example, he had the disconcerting habit now of ~~repeatedly~~ checking, when he thought himself unobserved, whether his fly was open. He had over the years become increasingly convinced that extraterrestrials did not exist, or at least that they were too rare, too distant to be detected. He had come to Argus to give the weekly scientific colloquium. But, she found, he had come for another purpose as well. He had written a ^{National Science Foundation,} letter to the ~~NSF~~ ^{NSF} urging that Argus terminate its search for extraterrestrial intelligence and devote itself full-time to more conventional radio astronomy. ^{He produced it from an inside pocket, and} ~~and~~ insisted that she read it.

"But we've only been at it four-and-a-half years. We've looked at less than a third of the Northern sky. This is the first survey that can do the entire radio noise minimum at ^{optimum} ~~small~~ bandpasses. Why would you want to stop now?"

"No, Ellie, this is endless. After a dozen years you'll find no sign of anything. ~~So then~~ ^{done,} you'll argue that another Argus facility has to be built at a cost of ^{hundreds of millions} ~~billions~~ of dollars in ~~the Southern~~ ^{Australia} ~~Hemisphere,~~ ^{or Argentina} to observe the southern sky. And when that fails, you'll talk about building some paraboloid with a free-flying feed in Earth orbit, so you can get ~~the millimeter wave frequencies that are~~ ^{that's how} ~~absorbed by the atmosphere.~~ You'll always be able to think of some kind of observation that hasn't been ~~made yet,~~ and you'll always find some explanation about why ~~the~~ extraterrestrials like to broadcast ["] ~~in~~ ["] this new way."

^{Dave,}
 "Oh, ~~X~~, we've been through this a hundred times. If we fail, we learn something of the rarity of intelligent life -- or at least intelligent life that thinks ^{like} ~~as~~ we do and wants to communicate with backward civilizations like us. And if we succeed, we hit the cosmic jackpot. There's no greater discovery you can imagine."

"There are first-rate projects that aren't finding telescope time. There's work on quasar evolution, binary pulsars, the chromospheres of nearby stars, even those crazy interstellar proteins. These projects are waiting in line, because this facility -- by far the best phased array in the world -- is being used almost entirely for SETI."

^{Dave, twenty-five}
 "Seventy-five percent for SETI, ~~X~~, ²⁵ percent for routine radio astronomy."

"Don't call it routine. We've got the opportunity to look back to the time that the galaxies were being formed, or maybe even earlier than that. We can examine the black holes at the centers of galaxies. ^[REVISE] There's a revolution in astronomy about to happen, and you're standing in the way."

^{Dave,}
^{of the last eighty dishes.}
 "~~X~~, try not to personalize this. Argus would never have been built if not for the public support for SETI. The idea for Argus isn't mine. You know they picked me as Director ^{well} after they'd begun construction. ¹ The NSF is entirely behind . . . "

"Not entirely, and not if I have anything to say about it. This is grandstanding. This is pandering to UFO kooks, and comic strips and weak-minded ~~teenagers~~ ^{adolescents}."

Drunlin

By now ~~X~~^A was fairly shouting. It was an irresistible temptation to tune him out. Because of the nature of her work, and her comparative eminence, she was constantly thrown into situations where she was the only woman present, except for those serving coffee or making a stenotypic transcript. ~~Men tended to be so tiresome in their~~ *Despite what seemed like a lifetime of effort,* ~~befuddlement about how to treat a pretty woman who had something to say. The fact that she had some organizational ability and a fair~~ *still* ~~finesse in scientific politics made it worse. There were a host of~~ *male scientists* ~~them~~ who only talked to each other, insisted on interrupting her, and ignored, when they could, what she had to say. ~~And~~ occasionally there were those like ~~X~~^{Dave} who showed a positive antipathy. But at least ~~X~~^{he} was treating her as he did many men. ~~Not much sexism in this intemperate~~ *He was even handed in his outbursts,* ~~outburst.~~ *visiting them equally on scientists of both sexes.* ~~There were a rare few of her male colleagues who did not~~ *exhibit* ~~have awkward personality changes or fits of patronization~~ in her presence. She ought to spend more time with them, she thought. People like Kenneth ~~Devries~~^{DeHeer}, the molecular biologist from the Salk Institute who had recently been appointed Presidential Science Advisor. And ~~Mr~~^{Dr} *Peter Valerian, of course.* ~~Dr~~^{Drunlin's} impatience with Argus, she knew, was felt by many. After the first two years a kind of melancholy had permeated the facility. There were passionate debates in the commissary or during the long and undemanding watches about the intentions of the putative extraterrestrials. We could not guess how different from us they might be. It was hard enough to guess the intentions of our elected representatives in Washington. What would the intentions be of

fundamentally different kinds of beings on physically different worlds hundreds or thousands of light years away? Some believed that the signal would not be transmitted in the radio spectrum at all, but in the infrared or the visible or somewhere ^{among} in the gamma rays ~~region~~. Or perhaps the extraterrestrials ^{were} ~~signaled~~ ^{ing} ~~but~~ ^{avidly,} with a technology we would not discover for a thousand years.

Astronomers at other institutions were making extraordinary discoveries among the stars and galaxies, picking out those objects which, by whatever mechanism, generated intense radio waves. ~~Those~~ ^{Other} radio astronomers published scientific papers, attended ^{meetings,} ~~symposia,~~ ^{were uplifted by} ~~meetings,~~ had a sense of progress and purpose. The Argus astronomers tended not to publish, tended to be ignored when the call went out for invited papers at the annual meeting of the American Astronomical Society, or the Triennial Symposia and Plenary Sessions of the International Astronomical Union. So in consultation with the National Science Foundation, the leadership at Argus had reserved 25 percent of the time on the ^{new} ~~telescopes~~ for ~~other projects,~~ projects unconnected with the search for extraterrestrial intelligence. Some important discoveries had been made -- on the extragalactic objects ^{paradoxically,} that seemed to be moving faster than light, and on the dark matter in the outer reaches of nearby galaxies where no stars could be seen. Morale began to improve. The Argus staff felt they were making a ^{at the cutting edge of astronomical discovery.} ~~significant contribution to astronomy.~~ The time to complete a full search of the sky had been lengthened, it was true, by 25 percent. But now ~~at least~~ their professional careers had some safety net. They

might not succeed in finding signs of other intelligent beings, but they might pluck other secrets from the treasury of nature. The scientists and engineers were now cheerful, even a little jaunty. The search for extraterrestrial intelligence -- everywhere abbreviated SETI, except by those who talked somewhat more optimistically about communication with extraterrestrial intelligence (CETI) -- was ~~the~~ ^{essentially an} observing routine; the dull staple for which ^{most of} the facility had been built. But a quarter of the time, you could be assured of using the most powerful array of radio telescopes on Earth for other projects. You had only to get through the boring part. A small amount of time had also been reserved for astronomers from other institutions. ~~But~~ ^{had improved noticeably} while the morale at Argus was ~~reasonably good~~, there were many who agreed with ~~X~~, ^{Drumlin,} who glanced longingly at the technological miracle that Argus' ~~1,000~~ ¹³¹ radio telescopes represented, and longed to use it for their own, doubtless meritorious, programs. She was alternately conciliatory and argumentative with ~~X~~, ^{Dave,} but none of it did any good. He was not in an amiable mood.

^{Drumlin's} ~~the~~ colloquium was ^{in part} an attempt to demonstrate that there were no extraterrestrials anywhere. If we had accomplished so much in only a few thousand years of high technology, what must a truly advanced species, he asked, be capable of? They should be able to move stars about, reconfigure galaxies. And yet in all of astronomy there was no sign of a phenomenon that could not be understood by natural processes, for which an appeal to extraterrestrial intelligence had to be made. ~~Despite one million UFO reports, there had not been a single~~

^{Argus} Why hadn't ~~they~~ not detected a radio signal by now? Did they imagine a single radio transmitter in all of the sky. ^{Did they realize they had many billions of stars they had examined already.} The experiment was a worthy one, but now it was over. They didn't have to examine the rest of the sky. The answer was in. already.

~~well-documented account of the visitation of the Earth by an~~
~~extraterrestrial spacecraft. No one had returned a piece of hull, or~~
~~a page from the Captain's logbook. Neither in the skies, nor on the~~ ^{deepest space} ~~near~~
 Earth was there any sign of extraterrestrials. They did not exist, ~~he~~
~~argued.~~

In the question period, one of the Argus astronomers asked about
 the Zoo Hypothesis, the contention that the extraterrestrials were out
 there all right, but chose not to make their presence known, to
 conceal from humans the fact that there were other intelligent beings
 in the Cosmos -- in the same sense that a specialist in primate
 behavior might wish to observe a troop of chimpanzees, but not
 interfere with their activities. In reply, ^{Drunlin asked a different question:} ~~asked if it is likely~~ ^{if}
 that with a million civilizations in the Galaxy -- the sort of
 number he said was "bandied about" at Argus -- there would not be a
 single poacher. [?] How does it come about that every civilization in the
 Galaxy abides by an ethic of non-interference? ~~Is it probable that~~
^{even} ~~not~~ one of them would ^{be poking} ~~poke~~ around on the Earth?

"But on Earth," Ellie replied, "poachers and game wardens have
 roughly equal levels of technology. If the game warden is a major
 step ahead -- with radar and helicopters, say -- then the poachers
 are out of business."

The remark was greeted warmly by some of the Argus staff, but ~~X~~ ^{Drunlin}
 only said "You're reaching, Ellie. You're reaching."

* * *

To clear her head it was her practice to go for long solo drives in her one extravagance, a carefully maintained 1958 Thunderbird with removable hardtop and little glass portholes ^{by} ~~for~~ the rear seat. ~~Most~~ Often she would leave the top at home and speed through the scrub desert at night, the windows down, her dark hair streaming behind her. Over the years, it seemed she had gotten to know every small impoverished town, every Segauro cactus, ^{and} every state highway patrolman ⁱⁿ Southwestern New Mexico. After a night observing run, she would love to zoom past the Argus guard station (that was before the cyclone fencing went up), rapidly changing gears while the faint glimmerings of dawn could be seen above the Sangre de Cristo [CHECK] mountains to the East. What kind of religion, she thought, names its places after the blood and body, heart and pancreas of its most revered figure? *And why not his brain, among other prominent ^{but uncommemorated} organs?*

Dave Could ~~X~~ be right? Could SETI and Argus be a kind of delusion, ^{collective} ~~an~~ *of a few* ~~insufficiently hard-nosed astronomers?~~ ~~arrogance?~~ Was it true that, no matter how many years go by without

the receipt of a message, the project would want to continue, always inventing a new strategy for the transmitting civilization, continually devising new and expensive instrumentation? What would be a convincing sign of failure? When would she be willing to give up, and turn to something safer, more guaranteed of results? The Nobeyama Observatory in Japan had just announced the discovery of adenosine, a

complex organic molecule, a building block of DNA, sitting there in a dense molecular cloud. She could certainly busy herself ~~purposefully~~ ^{usefully} in looking for life-related molecules ^{in space,} ~~by radio astronomy,~~ even if she gave up searching for extraterrestrial intelligence.

She glanced at the southern horizon and caught a glimpse of the constellation Centaurus. ^[WHAT SEASON VISIBLE FROM N.M.] In that pattern of stars, the ancient Greeks had somehow seen a chimerical creature, half man, half horse, who had taught Zeus wisdom. But Ellie could never make out any pattern remotely like a ~~Centaur~~. It was Alpha Centauri, the brightest star in the constellation, that she delighted in glimpsing. It was the nearest star, only four-and-a-quarter light years away. Actually, it was a triple system, two suns tightly orbiting one another, and a third, more remote and indifferent, circling them both. From Earth, the three stars blended together to form a solitary point of light.

(L.C.) On particularly clear nights, like this one, she could see it hovering ^{somewhere} over Venezuela. Sometimes, when the air had been laden with desert grit after several consecutive days of sand storms, she would drive up into the mountains to gain a little altitude and atmospheric transparency so she could view the nearest star system more clearly. Planets were possible there, although very hard to detect. Some might be closely orbiting any one of the triple suns. A more interesting orbit, with some fair celestial mechanical stability, was a figure 8, which wrapped itself around the two inner suns. What would it be like, she wondered, to live on a world with three suns in ^{the} ~~its~~ sky? Probably even hotter than New Mexico.

The two-lane blacktop highway, she noticed with a pleasant little tremor, was lined with rabbits. She had seen them before, especially when her drives had taken her as far as west Texas. They were on all fours by the shoulders of the road, but as ~~they were~~ ^{each would be} momentarily illuminated by the Thunderbird's new quartz headlights, ~~they~~ ^{it} would stand on ~~their~~ ^{its} hind legs, ~~their~~ ^{its} forelimbs hanging uselessly, transfixed. For miles there was an honor guard of desert coneyes, saluting her, so it seemed, as she roared through the night. They would look up, a thousand pink noses twitching, two thousand bright ~~eyes blinking~~ ^{shining in the dark,} as this apparition ~~from beyond the world of rabbits~~ hurtled towards them.

Maybe it's a kind of religious experience, she thought. They seemed to be mostly young rabbits. Maybe they had never seen automobile headlights. To think ~~about~~ ^{of} it, it was pretty amazing, the two intense beams of light hurtling along at 130 kilometers an hour. Despite the thousands of rabbits lining the road, there never seemed to be a ~~single~~ one in the middle of the road, near the lane marker, never a confused scurrying out of the way, never a forlorn dead body, the ears stretched out along the pavement. Why were they aligned along the pavement at all? Maybe it had to do with the temperature of the asphalt, she thought. Or maybe they were only foraging among the scrub vegetation nearby. But was it reasonable that none of them ever

~~indulged in the extravagance of taking~~ ^{took short} a few hops to visit his cousins across the road? What did they imagine the highway was? An alien presence in their midst, its function unfathomable, built by creatures that most of them had never seen. She doubted that any of them ~~ever~~ wondered about it.

The whine of her tires on the highway was a kind of white noise, and she found that, involuntarily, here too she was listening for a pattern. She had taken to listening closely to many sources of white noise: the motor of the refrigerator starting up in the middle of the night; the water running for her bath; the washing machine when she would do her clothes in the little laundry room off her kitchen; the roar of the ocean during a brief scuba diving trip to the island of Cozumel off Yucatan, which she cut short because of her impatience to get back to work. She would listen to these everyday sources of random noise and try to determine whether there were fewer apparent patterns in them than in the interstellar static.

She had been to New York City the previous August for a meeting of URSI (the French abbreviation for the International Scientific Radio Union). In the clacka-clacka of ~~the subway~~ ^{this underground railway}, she had thought she

heard a clue, and resolutely skipped half a day of meetings --

traveling from 34th Street to Coney Island, back to midtown Manhattan, ^{and}

~~then, with a different railroad,~~ ^{then, with a different ~~railroad~~ ^{lines}} out to remotest Queens, changing trains at a station called Babylon, and then returning a little

flushed and breathless (it was, after all, a hot day in August, she told herself) to her meeting hotel. Sometimes, when the subway train

The subways were dangerous, she had been told, but the white noise was irresistible.

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-- locked in a protective cage and
spray-painted blindman,

was banking around a steep curve, interior bulbs would go out and she could see a regular succession of lights, glowing in a soft electric blue, speeding by as if she were in some impossible hyper-relativistic interstellar spacecraft, hurtling through a cluster of young blue supergiant stars. ~~But then~~ the interior lights would come on again ~~as~~ as the train entered a straightaway, and she would become aware once again of the acrid smell, the jostling of nearby straphangers, the stylized multicolored map showing the complete underground transportation system of the City of New York, and the high-frequency screeching of the brakes as they pulled into the station.

This was a little eccentric, she knew. But she had always had an active fantasy life. ~~She was, she admitted to herself, a little compulsive about listening to sources of noise. But~~ All right. So ~~It~~ It did no harm that she could see. Nobody seemed to notice much. It was job-related. If she had been so minded, she could probably have

deducted the expense of her trip to Cozumel from her income tax, ~~because of~~ the sound of the brakes.

Maybe she was becoming obsessive. She realized with a start that she had arrived at the 57th Street station. As she quickly stepped out through an accumulation of daily newspapers ~~carelessly~~ abandoned on the floor of the subway car, the headline of the News-Post had caught her eye: GUERILLAS CAPTURE JOBURG RADIO STATION. On the opposite page was a large photo of a ~~handsome, somewhat~~ confident florid man with the caption: HOW THE WORLD WILL END. EXCERPTS FROM THE REV. BILLY JOE RANKIN'S NEW BOOK, EXCLUSIVELY THIS WEEK IN THE NEWS-POST. She had taken the headlines in at a glance and tried promptly to forget them,

taking care not to ~~implant them~~^{overload} in her long-term memory. Moving through the bustling crowds to the meeting hotel, she hoped she was in time to hear Fujita's paper on homomorphic radio telescope design.

Superposed on the whine of the tires there was a periodic thump at the joins of swathes of pavement, resurfaced by different road crews in different ~~times~~^{epochs}. What if an interstellar message were being received by the Argus Project, but very slowly -- one bit of information every hour, say, or every week, or every decade? What if there were very old, very patient, murmurs of some transmitting civilization, who had no way to know that we get tired of pattern recognition after seconds or minutes? Suppose they lived for tens of thousands of years. And T A A A A L K E D V E R R R Y

S L O O O O W W W W L Y, talked till they were blue in the face ~~for~~
~~assuming they weren't already blue~~ (She was making assumptions,
~~some equivalent collection of sensing, breathing, speaking and~~
~~she knew, about what color they were when silent~~).
~~digesting organs~~). And Argus would never know. But could such
~~long-lived creatures exist?~~ ^{in the lifetime of the universe} Would there have been enough time for
~~such slowly reproducing creatures to have evolved to high~~ ^{that reproduced very slowly}
intelligence? Wouldn't the statistical breakdown of chemical bonds, the deterioration of their bodies according to the Second Law of Thermodynamics, force them to reproduce about as often as human beings do? And to have life spans like ours? Or might they reside on some

very old and very frigid world, where ~~everything happens far slower~~ ^{even molecular collisions occur in} extreme slow motion, maybe a frame a day. ^{transmitter} ~~than a snail's pace?~~ She idly imagined some great radio telescope of ^{of methane ice} recognizable and familiar design, sitting on a ~~sheer ice~~ cliff, feebly illuminated by a distant red dwarf sun, while, far below, waves of an ammonia ocean beat relentlessly against the shore, ^{-- and incidentally} generating a white noise indistinguishable from that of the surf at Cozumel.

The opposite was possible as well, the fast talkers, ^{manic} little creatures perhaps, moving with ~~astonishingly~~ quick and jerky motions, a complete radio message -- the equivalent of hundreds of pages of English text -- transmitted in a nanosecond. Of course, if you had a very narrow bandpass to your receiver, so you were listening only to a tiny range of frequencies, you were forced to accept the long time-constant. ^{You would be} ~~and~~ never able to detect a rapid modulation. It was a simple consequence of the Fourier Integral Theorem, and related mathematically to the Heisenberg Uncertainty Principle. So, for example, if you had a bandpass of a kilohertz, you couldn't make out a signal that was modulated at faster than a ^{millisecond} ~~thousandth of a second~~. It would be a kind of sonic blur. The Argus bandpasses were much narrower than a ~~H~~ertz, so to be detected, ^{the} transmitters must be modulating very slowly, slower than one bit of information a second. Still slower modulations -- longer than hours, say -- could be detected easily, provided you were willing to point a telescope at the source for that length of time, provided you were exceptionally patient. There were so many pieces of the sky to look at, so many hundreds of billions of stars to search out. You couldn't spend all

of them.
 your time on only a few ~~stars~~. She was troubled that, in their haste to do a full sky survey in less than a human lifetime, to listen to all of the sky at a billion frequencies, they had abandoned both the frantic talkers and the ~~deliberate~~ ^{flooding} ones.

But surely, she thought, they would know better than we what modulation frequencies were acceptable. They would have had previous experience with interstellar communication and newly emerging civilizations. If there was a broad range of likely pulse rates that

Modulate at microseconds, modulate at hours.

would utilize such a range. What would it cost them? They ~~were~~ ^{would, they} almost all of them, have

~~almost by definition, much more powerful than we, with superior engineering and enormously greater power resources. If there were intelligent beings out there, there must be many who have capabilities amazingly beyond our own.~~ ^{by Earth standards.} If they wanted to communicate with us, they would make it easy. They would send signals at many different frequencies. They would use many different modulation timescales.

They would know how backward we are, and have pity on us.

So why ~~then~~ ^{Could Dave possibly be} had we received no signal? Was ~~X~~ ^{anywhere?} right? and there were ~~no~~ ^{anywhere?} extraterrestrial civilizations? ~~Could~~ ^{Could} all of those billions of worlds be going to waste, lifeless, barren, with ~~I~~ ^{this} intelligent beings

growing up only in ~~our~~ ^{No matter how valiantly she tried, she couldn't make} obscure corner of an incomprehensibly vast universe? ~~herself take such possibilities seriously.~~

Wait a minute, she thought. ~~All of this is prematurely gloomy.~~
 We haven't even examined the northern skies once with the Argus

system. In another seven or eight years, if we've still heard

They were dovetailed perfectly with human pretensions and fears, like a life-after-death and astrology. They were suspect on these grounds alone.

Jul. This insect mission found out.

1 February, 1985

MISC. CONTACT INSERTS:

INSERT FOR PAGE 3/23:

They were the modern incarnation of the geocentric solipsism,
the conceit that had captured our ancestors, the pretention that we
were the center of the universe. [REDUNDANT?]

nothing, that'll be the time to start worrying. This is the first moment in human history when it's possible to search for ~~other~~ intelligent beings, the inhabitants of other worlds. If we fail, we've ~~have~~ calibrated something of the rarity and preciousness of life on our ~~own~~ planet -- a fact, ^{if it is one,} very much worth knowing. And if we succeed, we ~~will~~ ^{will} have changed the history of our species. With the stakes this high, you have to be willing to take some minor professional risks. She pulled off the side of the road and did a shallow racing turn, changed gears twice, and accelerated back towards the Argus facility. The rabbits craned their necks ~~better~~ to follow her departure.

Second draft

Chap. 4

~~23 April, 1984~~

PRIME NUMBERS

The cold black vacuum had been left behind. The pulses
were now approaching an ordinary yellow dwarf star, and had
already begun spilling over the retinue of worlds in this
obscure system. They had fluttered by planets of hydrogen
gas, penetrated ^{into} ~~the surface~~ of moons ~~made~~ of ice, breached the
organic clouds of a frigid world on which the precursors of
life were stirring, and swept across a planet a billion years
past its prime. Now the pulses were ^{washing against} ~~encountering~~ a warmer
world, blue and white, spinning against the backdrop of the
stars.

There was life on this world, extravagant in its numbers
and variety. There were jumping spiders at the chilly tops of
the highest mountains, and sulfur-eating worms in hot vents
gushing up through ridges on the ocean floors. There were
beings that could live only in concentrated sulfuric acid, and
beings that were destroyed by concentrated sulfuric acid;
organisms that were poisoned by oxygen and organisms that
could survive only in oxygen, that actually breathed the
stuff.

A particular lifeform, with a modicum of intelligence,
had recently spread across the planet. They had outposts on
the ocean floors and in low altitude orbit. They had swarmed
to every nook and cranny of their small world. The boundary

that marked the transition of night into day was sweeping westward, and following ^{its} ~~the~~ motion of ~~this boundary~~ millions of these beings ritually performed their morning ablutions. They donned greatcoats and dhotis; drank brews of ^{coffee} tea or ^{and} ~~Donation~~; checked on the bicycles, automobiles and oxen; and contemplated briefly school assignments, prospects for spring planting, ^{and} ~~or~~ the fate of the world.

The first pulses in the train of radio waves insinuated themselves through the atmosphere and clouds, struck the landscape and were partially reflected back to space. As the Earth turned beneath them, successive pulses arrived, engulfing not just this one planet but the entire system. Very little of the energy was intercepted by any of the worlds in this system. Most of it passed effortlessly onwards, into the depths of space -- ~~even~~ as the yellow star and its attendant worlds plunged, in an altogether different direction, into the inky dark.

The setting Sun bathed the New Mexico desert in a preternatural red. Like ~~great soaring flowers~~, ^{hundred} ~~thousand~~ radio telescopes, ~~all working~~ ^{together searching} ~~cooperatively to seek possible radio signals from civilizations on~~ ^{the} planets of other stars. The telescopes themselves, gleaming pinkly, ^{operated without} ~~had no~~ human attendants. Their output was ^{gathered into} ~~coordinated~~ in a central control building. All but a few of ~~them~~ ^{upward} were pointing at precisely

the same direction, ~~in the sky~~; the remainder were attending
to a ~~part of the~~ ^{swatch of} sky a little closer to the setting Sun.

Wearing a dacron jacket displaying the word "Marauders"
~~above~~ ^{Felt volleyball,} ~~over~~ ^{night} a stylized ~~basketball~~, the ~~duty officer~~, ^{his} beginning the
~~night~~ shift, approached the control building, ~~and encountered~~ ^{was}
group of radioastronomers, just leaving for dinner.

"How long have you guys been ~~searching~~ ^{looking} for little green
men? It's more than five years, isn't it now, Willie?"

They chided him good naturedly, but he could detect an
edge to their banter.

"Give us a break, Willie. ~~Our~~ ^{The} quasar luminosity program
is going great guns. But it's gonna take forever if we only
have two percent of the telescope time.

"Sure, Jack, sure."

"Willie, we're looking back towards the origin of the
universe. There's a big stake in our program too and we know
there's a universe; ^{out there} you don't know there are any little green
men."

"Take it up with Dr. Arroway. I'm sure she'll be glad to
hear your opinion."

~~With an unaccustomed frown,~~ ^{The} the duty officer entered the
control area. He made a quick survey of dozens of television

screens monitoring the progress of the radio search. They had just

finished examining the constellation Hercules. They had ~~looked at a~~ *peered*

into the heart of a

great swarm of galaxies, far beyond the Milky Way, the Hercules

— hundred million light years away;

gravitationally bound Cluster; they had tuned in on M-13, a swarm of a million [CHECK]

24,000 [CHECK] light years away;

stars together moving in orbit around the Milky Way Galaxy; they had

examined the stars _____, _____, and _____

_____ -- some different from the Sun, some similar to it, all

nearby. Most of the stars you ~~could~~ *can* see with the naked eye are less

than a few hundred light years away. They had carefully monitored

hundreds of little sectors of the sky within the constellation

Hercules at a billion separate frequencies, and they had heard

nothing. In previous years they had searched the constellations

immediately west of Hercules -- Serpens, Corona Borealis, Boötes,

Canes Venatici . . . and, there also, they had heard nothing. There

were the characteristic radio lines of simple organic molecules in

great clouds of gas and dust between the stars. There was the

fluttery hum of pulsars, the whistling of electrons trapped in the

intense magnetic fields of quasars, storms in the high atmospheres of

nearby stars. But they had never heard a signal intentionally

transmitted by some extraterrestrial civilization -- nothing that

ever sounded artificial, nothing that smelled like some galactic Morse

code.

A few of the telescopes, the duty officer could see, were devoted

to picking up some missed data in Hercules. The remainder ~~— almost~~

~~a thousand telescopes~~ were aiming, boresighted, at an adjacent

patch of sky, the next constellation east of Hercules. ~~Its brighter members were more tightly clustered together in the sky than was true for most constellations.~~ To those in the eastern Mediterranean a few thousand years ago, it had ~~somehow~~ resembled a stringed musical instrument, and was associated with the Greek culture hero, Orpheus.

Its name was Lyra, the Lyre.

to follow the stars from horizon to horizon,
The computers turned the telescopes, accumulated the ~~data~~, *radio photons,* monitored the health of ~~all the~~ *the* thousand telescopes, and processed the data in a format convenient for their human operators. Even one duty officer was something of an ~~extravagance~~, *indulgence. Walking by* ~~Passing~~ a bottle of sucking candies, a coffee machine, a sentence in elfish Runes out of Tolkien by the Artificial Intelligence Laboratory at Stanford, and a bumper sticker reading "BLACK HOLES ARE OUT OF SIGHT," Willie approached the command console, and nodded pleasantly to the afternoon duty officer, now collecting his notes and preparing to leave for dinner. Because the day's data were conveniently summarized in amber on three video display screens, there was no need for Willie to inquire about the progress of the preceding hours.

-- at least that's what it looked like -- in 49"
"As you can see, nothing much. There was an ~~apparent~~ ^a pointing glitch in ~~661~~,[^] he said, *(vaguely waving toward the window.* "The quasar bunch freed up the ~~700's~~,^{110's and 120's} about an hour ago. They seem to be getting very good data."

"Yeah, I heard. ~~See you.~~ *They don't understand...*"

~~[TOO PREDICTABLE TIMING?]~~

His voice trailed off as

~~No sooner had the afternoon duty officer turned on his heel than~~
an alarm light flashed decorously on the console in front of ~~Willie~~ *them.*

~~"Hey, Steve, come on back if you've got a moment. Something interesting is happening."~~

N. 97
On a display marked "Intensity ^{vs} ~~versus~~ Frequency" a sharp vertical spike was rising.

"It's a monochromatic signal, all right."

Another display, labelled "Intensity ^{vs} ~~versus~~ Time" showed a set of pulses moving left to right and then off the screen.

"Those are numbers," Willie said faintly. "Somebody's broadcasting numbers."

"It's ^{probably} some Air Force interference. I saw an AWACS from Kirtland, ~~at~~ about 1600 hours. Maybe they're spoofing us for kicks."

There had been solemn agreements to safeguard at least some radio frequencies for astronomy. But ~~for the very reason that these~~ ^{precisely because these}

frequencies represented a ~~relatively~~ ^{to} clear channel, the military found them occasionally irresistible. ~~Listening at~~ ^{had to} a billion frequencies at

once, the astronomers ~~could not expect that there would be no~~ ^{some} ~~disruption.~~ ^{interference.} Lightning, automobile ignitions, direct broadcast

satellites were all sources of ^{radio} interference. But the computers had their number, knew their characteristics, and automatically suppressed them.

Signals that were more ambiguous, the computer would listen to

with greater care, to make sure it matched no inventory of frequencies

it was programmed to understand, ~~and in an hour or two to see if the~~ ^{a few minutes, it would have been very sure if}

^{whether} ~~the~~ radio source moved with the sky. Every now and then some electronic

intelligence ^{aircraft} ~~plane~~ on a training mission -- sometimes with a radar

^{dish coyly disguised} ~~system enclosed~~ in a kind of flying saucer camped on its haunches --

If ^{global} war ever came -- much less likely ~~than~~ ^{perhaps} now that nuclear weapons were being ~~deaccessioned~~ ^{perhaps} the radioastronomers would probably be the first to know, ~~as~~ ^{with} their windows to the cosmos overflowing with orders to battle management and damage assessment ^{in geosynchronous orbit} satellites, and the transmission of coded launch commands to distant strategic outposts. Even with no military traffic,

would fly by, and ARGUS would suddenly detect unmistakable signatures of intelligent life. But it would always turn out to be life of a peculiar and melancholy sort, intelligent to a degree, extraterrestrial just barely, ~~but with its global resources seemingly directed towards incipient self-destruction.~~ A few months before, an F27E with state-of-the-art electronic countermeasures passed overhead at 80,000 feet and sounded the alarms on all ~~thousand~~¹³¹ telescopes. The radio signature had been very complex, ~~it looked~~^{to} complex enough to be a plausible first message from an extraterrestrial civilization. But ~~then~~ they found the westernmost radio telescope had received the signal ____ seconds before the easternmost, and it soon became clear that it was an object streaking through the thin envelope of air surrounding the Earth, rather than a broadcast from some unimaginably different civilization in the depths of space. *Almost certainly, this one was the same thing.*

** * **
"Is Dr. Arroway on-site?" ** **

"Yeah, I ~~saw her less than an hour ago. Her alarm must be~~ buzzing. In fact, here she is now."

al to the main console,
She ~~was walking briskly, her dark eyes gleaming and softening the~~
~~angular bone structure of her face. Her attitude was very much no~~
~~nonsense.~~ ✓

"Good evening, Willie, Steve. Let's see the data. Good. Now where did you put the amplitude-time plot? Good. Do you have the interferometric position? Okay. Now let's see if there's any nearby star in that field of view. Oh my, we're looking at Vega. That's a pretty near neighbor."

Her fingers were punching away at a keyboard as she talked.

"Look, it's only 26 light years away. I know it's been observed before, always with negative results. I looked at it myself in my first Arecibo survey. What's the absolute intensity? Holy Toledo. That's hundreds of Janskys. You could practically pick that up on your FM radio.

"Okay. ~~Let's see if we can summarize.~~ ^{So we} We have a bogey very near to Vega in the plane of the sky. It's at a frequency around 22.417 gigahertz, not very monochromatic: the bandwidth is about 100 hertz. It's linearly polarized and it's transmitting a set of moving pulses restricted to two different amplitudes."

In response to her typed commands the screen now displayed the disposition of all ~~thousand~~ ^{the} radio telescopes.

"And ~~it~~ ¹¹⁶ ~~943~~ ¹¹⁶ it's being received by telescopes individually. Clearly it's not a malfunction in an individual telescope. Okay, now do you have enough time baseline to confirm that it's moving with the stars? Are we sure it isn't some ELINT satellite or aircraft?"

"Just enough baseline now, Dr. Arroway. I can confirm sidereal motion."

"Okay, that's pretty convincing. It's not down here on Earth, and it probably isn't from an artificial satellite in a Molniya orbit, although we ~~can~~ ^{should} check that. When you get a chance, Willie, call up NORAD and see what they say about the satellite possibility. If we can exclude satellites, that will leave two possibilities: it's a hoax, or somebody has finally gotten around to sending us a message.

Steve, will you do a manual override ~~of the automatic mode~~, and check a few individual radio telescopes -- the signal strength is certainly large enough -- and see if there's any chance that this is a hoax? You know, a practical joke by someone who wishes to teach us the error of our ways."

A handful of other scientists and technicians, alerted on their portable buzzers by the ARGUS computer, had gathered around the command console. There were half smiles on their faces. None of them was thinking seriously of a message from another world quite yet, but there was a sense of no school today, a break in the tedious routine to which they had become accustomed, and perhaps a faint air of expectation.

"And if any of you can think of any other explanation besides extraterrestrial intelligence, I want to hear about it," *she said, acknowledging their presence.*

"There's no way it could be Vega, Dr. Arroway. The system's only *Its planets are still in the process of forming.* a few hundred million years old. There isn't time for intelligent life to have developed there. It has to be some background star or galaxy."

"But then the transmitter power has to be ridiculously large," responded one of the quasar group who had returned to see what was happening. "We need to get going right away on a ~~very~~ sensitive proper motion study, so we can see if the radio source moves with Vega."

"Of course, you're right about the proper motion study, Jack," she continued. "But there's another possibility. Maybe they didn't grow up in the Vega system. Maybe they're just visiting."

"That's no good either: the system is full of debris. It's a failed solar system or a solar system still in its early stages of development. If they stay very long, their spacecraft is gonna be clobbered."

"So they only arrived recently. Or they vaporize incoming meteorites. Or they take evasive action if there's a piece of debris on a collision trajectory. Or they're not in the ring plane but in polar orbit, so they minimize their encounters with the debris. There's a million possibilities. But you're absolutely right: we don't have to guess whether the source is in the Vega system. We can actually find out. How long will that proper motion study take? By the way, Steve, this isn't your shift. ^{At least tell} ~~Have you told~~ Beth you're going to be late for dinner ~~man~~."

Willie, who had been talking on the phone at an adjacent console, was displaying a wan smile:

"Well, I got through to a Major Braintree at NORAD. He swears ^{up and down} they have nothing that'll give this signal, especially not at 22 gigahertz. Anyway, he says ^{they haven't} ~~that they have~~ detected ^{any} ~~no~~ spacecraft at the right ascension and declination of Vega."

"What about darks?"

By this time there were many "dark" satellites with low radar cross sections, designed to orbit the Earth unannounced and undetectable until some hour of need -- when they would have to serve as backups for ~~launch command~~, ^{or} launch detection, ~~communications~~, ~~or damage assessment~~ in a nuclear war, in case the announced first

line military satellites for these purposes were suddenly ~~destroyed~~ ^{missing in action}.
~~into~~

Occasionally, a dark satellite would be detected by one of the major astronomical radar systems. All nations would deny that the object ~~detected~~ belonged to them, and speculation would episodically become rife that an extraterrestrial spacecraft had been detected in Earth orbit. ^{As the Millenium approached,} UFO cults were thriving.

"Interferometry now rules out a Molniya-type orbit,
Dr. Arroway."

"Better and better. Now let's take a closer look at those moving pulses. Assuming that this is binary arithmetic, has anybody converted this into base 10? Do we know what the sequence of numbers is? Okay, here, we can do it in our heads . . . 59, 61, 67, . . . 71 . . . Aren't these all prime numbers?"

^{little} A buzz of ~~restrained~~ excitement circulated through the control room. Ellie's own face momentarily revealed a flutter of something deeply felt, but quickly replaced by a sobriety, a fear of being carried away, an apprehension about appearing foolish, unscientific.

"Okay, let's see if I can do another quick summary. I'll do it in the simplest language. Please check ~~out~~ if I've missed anything. We have an extremely strong, not very monochromatic signal.

Immediately outside the bandpass of this signal, there are no other frequencies reporting anything besides noise. The signal is linearly polarized, as if it's being broadcast by a radio telescope. The signal is around 22 gigahertz, at a minimum in the galactic radio noise background. It's the right kind of frequency for an advanced

civilization to transmit on. We've confirmed sidereal motion of the source, so it's moving as if it were up there among the stars and not some local transmitter. NORAD tells us that they don't detect any satellites -- ours or anybody else's -- that match the position of this source. Interferometry excludes a source in Earth orbit anyway. Steve has now looked at the data outside the automated mode, and it doesn't seem to be a program that somebody with a warped sense of humor put into the computer. The region of the sky we're looking at includes Vega, which is an A-^{Red.}Zero main sequence dwarf star. It's not exactly like the Sun, but it's only 26 light years away, and it has the prototype stellar debris ring. There are no known planets, but there certainly could be planets we don't know anything about around Vega. We're setting up a proper motion study to see if the source is well behind our line of sight to Vega, and we should have an answer in -- what? -- three or four days. Finally, what's being sent seems to be a long sequence of prime numbers, integers that can't be divided by any other number except themselves and one. No astrophysical process is likely to generate prime numbers. So I'd say -- we want to be cautious, of course, -- but I'd say that by every criterion we can lay our hands on, this looks like the real thing.

"But there's a problem with the idea that this is a message from guys who evolved on some planet around Vega, because they would have to evolve very fast. The entire lifetime of the star is only about four hundred million years. It's an unlikely place for the nearest civilization. So the proper motion study is very important. But also I sure would like to check out that hoax possibility ^{some more."} ~~a little bit~~ ~~better."~~

"Look," said one of the quasar survey astronomers who had been hovering in the back. He inclined his jaw to the Western horizon where a faint ^{pink} aura ^{showed unmistakably} ~~still signified~~ where the Sun had set. "This source is going to set in another couple of hours. It's probably already risen in Australia. Can we call Sydney and get them looking ~~at it~~ at the same time that we're still seeing it?"

"Good idea, Jack. It's only middle afternoon there. Give me that summary printout, and I'll telefax it to Australia from my office."

With considerable composure, Ellie left the assembled group crowded around the consoles, and returned to her office. She closed the door very carefully behind her. ~~Her face glowing with a faraway look, she softly murmured, "Holy shit!"~~ ^{and} ~~With a conscious effort she resumed her professional demeanor and proceeded to call Australia.~~ ^{she whispered.} ✓

"Ian Broderick, please. Yes. This is Elinor Arroway at Project Argus. It's something of an emergency. Thanks, I'll hold on. Hello, Ian? It's probably nothing, but we have a ~~bit of a~~ bogey here and wonder if you could just check it out for us. It's around 22 gigahertz, with a few hundred hertz bandpass. I'm telefaxing the parameters now. You have a feed good at 22 gigahertz already on the dish? That's a bit of luck. Yes, Vega is smack in the middle of the field of view. And we're getting what looks like prime number pulses. ^{Really. OK, I'll hold on.} Listen, while the telescope finishes slewing, ^{Ian,} ~~maybe~~ ^(you could) set up to look at an amplitude-time plot? Let's call the low amplitude pulses dots and the high amplitude pulses dashes. We're

~~As the calls her telephone was dialing the number, she reflected again on how backward the world astronomical community still was. A joint computer databasing system was still not on-line. ^{in Sydney} ~~It could be used for asynchronous telenetting alone would...~~ ^{comp. based} ^{its value}~~

getting . . . yes, that's just the pattern we've been seeing for the last half hour . . . Maybe. Well, it's the best candidate in ^{five} ~~four and a half~~ years. But I just keep remembering now badly the Soviets got fooled with that Big Bird satellite incident around '74. Well, the way I understand it, it was a radar altimetry survey of the Soviet Union for ~~cr~~ cruise missile guidance. Yes, a terrain mapper. All the Soviet astronomers knew was they were getting the same sequence of pulses from the sky at about the same time every morning. No, we've excluded a satellite transmission already."

(D.C.)
 During the course of this conversation, Ellie had placed the ^{were inserted} ~~the~~ fingers of her right hand into five evenly spaced receptacles ^{in a box} ~~in the~~ ^{low} ~~wall~~. She now withdrew her hand and was admiring the uniformly applied nail polish. Since the invention of this device, she was able to save half an hour a week. ^{But there hadn't really been} ~~Until now, there hadn't been~~ a great deal to do with that extra half hour.

"Ian, could we trouble you to follow it for as long as it's in your sky? I'm going to see if I can't get a number of other radio observatories, distributed pretty evenly in longitude, to follow ~~this it~~ until it reappears back here. Yes, but I don't know if it's easy to make a direct phone call to China. I'm thinking of sending an IAU telegram. Fine. Many thanks, Ian."

In the doorway of the ^{control} ~~display~~ room -- they ^{called it that with some} ~~tried not to call it~~ ^{that} ~~unconscious irony, because it was~~ the "Control Room" because the computers, in another room, by and large, ^{did} ~~did~~ the controlling -- she paused for a moment to admire the small group of scientists, talking with great animation, closely

✓
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scrutinizing the data being displayed, and engaging in good-natured speculation on the nature of the signal. These were not mainly stylish people, she thought. They were not conventionally good-looking. But there was something unmistakably attractive about them. They were excellent at what they did, and ^{especially} ~~when there was~~ *in the discovery* ~~something like a signal~~ *some process,* they were utterly absorbed in their work. As she approached ~~them~~ they fell silent, and looked at her expectantly.

"Willie, get me a world map. And please get me Brian Marsden in Cambridge, Massachusetts. [NAME TO BE CHANGED] ~~You may have to get~~ *He'll probably be at home.* ~~him out of bed.~~ Give him this message for an IAU telegram to all observatories, but especially to all large radio observatories. And see if he will check our telephone number for the ^{Beijing} ~~Tientsin~~ [CHECK] Radio Observatory. Then get me the President's Science Advisor."

"You're going to bypass the National Science Foundation [?] ~~hierarchy?~~"

"After Marsden, get me the President's Science Advisor."

In her mind, she thought she could hear one joyous shout amidst a clamor of other voices.

By bicycle, small truck, perambulatory mailman, or telephone, the single paragraph was delivered to astronomical centers all over the world. In a few major radio observatories -- in China, India, the Soviet Union, and Holland, for example -- the message was delivered by teletype. As it chattered in, it was scanned by a security officer

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or some passing astronomer, torn off, and with a look of some curiosity, carried into an adjacent office. It read:

ANOMALOUS ~~AND~~ INTERMITTENT RADIO SOURCE
AT RIGHT ASCENSION 18h 34m, DECLINATION
PLUS 38 DEGREES 41', DISCOVERED BY ARGUS
SYSTEMATIC SKY SURVEY. FREQUENCY 22.4176684
GIGAHERTZ, BANDPASS APPROXIMATELY 430 HERTZ.
BIMODAL AMPLITUDES APPROXIMATELY 1741 AND
1798 JANSKYS. SOME EVIDENCE AMPLITUDES
ENCODE SEQUENCE OF PRIME NUMBERS. FULL
LONGITUDE COVERAGE URGENTLY NEEDED. PLEASE
CALL COLLECT FOR FURTHER INFORMATION IN
COORDINATING OBSERVATIONS.
E. ARROWAY, DIRECTOR, PROJECT ARGUS,
SOCORRO, NEW MEXICO, U.S.A.

Second draft

Chap. 5

~~23 April, 1984~~

DECRYPTION ALGORITHM

The visiting scientists' quarters were now all occupied, indeed overcrowded with selected luminaries of the SETI community. When the official delegations began arriving from Washington, they found no suitable accommodations at the Argus site, and had to be billeted in motels in nearby Socorro. Kenneth ^{Der Heer} ~~Devries~~ was the only exception. He had arrived the day after the discovery, in response to an urgent call from Elinor Arroway. Officials from the National Science Foundation, the National Aeronautics and Space Administration, the Department of Defense, the President's Science Advisory Committee, the National Security Council, and the National Security Agency trickled in during the next few days. ~~And there~~ were some government employees whose precise institutional affiliation remained obscure.

The previous evening, a few of them, standing at the base of Telescope ^{101,} ~~449,~~ had Vega pointed out to them for the first time. ^{Obligingly,} ~~its~~ blue-white light flickered prettily. 1

"I mean, I know I've seen it before, but ^{I never knew what it was called,} ~~this is the first~~ ^{its name is,} ~~time I knew what it was called,~~" one of them remarked. It appeared brighter than ~~almost all~~ the other stars in the sky, ^{But, in no other way} ~~otherwise, it seemed hardly~~ noteworthy. It was merely one of the few thousand naked-eye stars, ~~that someone with keen vision can distinguish on a clear desert night.~~ ✓

The scientists were running a continuous research seminar on the nature, origin and possible significance of the radio pulses. The project's public affairs office -- larger than in most observatories, because of widespread interest in the search for extraterrestrial intelligence -- was assigned the task of filling in the lower ranking officials. Every new arrival required an extensive briefing. Ellie -- who was obliged to brief the senior officials, supervise the ongoing research, and respond to the entirely proper skeptical scrutiny being offered with some vigor by her colleagues -- was exhausted. The ^{luxury} ~~grail~~ of a full night's sleep had eluded her since the discovery.

At first they had tried to keep the finding quiet. After all, they were not absolutely sure it was an extraterrestrial message. A premature or mistaken announcement would be a public relations disaster. But, even worse than that, it would have ~~carried their~~ ^{swept} ~~attention away from~~ the data analysis. If the press descended, the science would surely suffer. Washington, as well as ~~the~~ Argus, ~~Project~~, was keen to keep the story quiet. But the scientists had

~~told their families, the International Astronomical Union telegram had been sent all over the world, and they knew there would be at best~~ ^{and astronomical databasing systems in Europe, North America and Japan were all carrying news of the discovery.} ~~only a brief period before they would have to deal with the press,~~ ^{They knew there would be} ~~only a brief period before they would have to deal with the press,~~ ^{would descend.}

They had tried to discourage reporters from visiting the site,

explaining that there was no real information in the signals they were ^{just tedious and repetitive prime numbers.} receiving, ~~The press stalked the officials from Washington when they~~

returned to their motels at night, and a few of the more enterprising

fixed-wing
air taxis
and

The press was impatient with the absence of hard news. You can only do so many side-bars on "What is a prime number?" one reporter explained to Ellie. ^{television} Camera crews in chartered helicopters began making low passes over the facility ^{sometimes} generating strong radio interference easily detected by the telescopes. ^{some} Reporters

enter the facility unobserved — by automobile beach buggy, motorcycle, and in one case on horseback.

among them had attempted to ignore the restrictions. She had even been forced to inquire about bulk rates on cyclone fencing. ~~The situation was volatile.~~

Although there had been a range of contingency plans for the public release of any findings, the actual circumstances had caught them ^{largely} unprepared. ~~So~~ they drafted as innocuous a statement as they could, and released it only when they had to. It caused, of course, a sensation.

Immediately after ^{Dr. Hoer} ~~DeVries~~ arrived, he had received an early version of what was ^{by} now Ellie's standard briefing: the surprising intensity of the signal, its location in very much the same part of the sky as the star Vega, the nature of the pulses.

"I may be the President's Science Advisor," he had said, "but I'm only a biologist. So please explain it to me slowly. I understand that if the radio source is 26 light years away, then the message had to be sent 26 years ago. In the late 1960's, some funny-looking guys with pointy ears thought we'd ^{want} be fascinated to ~~know that they like~~ hear that they're fond of prime numbers. But, ~~Ellie~~ prime numbers aren't ~~even~~ difficult. It's not like they're boasting. It's more like they're sending us remedial arithmetic." *Maybe we should be insulted."*

"No, look at it this way," she had smiled. "This is a beacon. It's an announcement signal. It's designed to attract our attention. We get strange patterns of pulses from quasars and pulsars and radio galaxies and God-knows-what. But prime numbers are very specific, very artificial. It's hard to imagine some radiating plasma, some exploding galaxy, sending out ~~such~~ a regular

set of mathematical signals, ^{like this.} The prime numbers are to attract our attention."

"But what for?" he had asked, genuinely baffled. prime numbers

But in this business you have to be very patient.

"I don't know. Maybe in a while the signal will turn off, replaced by something else, something very rich, the real message. We just have to keep on listening."

This was the hardest part to explain to the press, that the signals had no ^{essentially} ~~specific~~ content, just the first ~~few dozen~~ ^{in order,} thousand or so prime numbers, ~~and then~~ a cycling back to the beginning, and again the simple binary arithmetic representations: ~~of~~ 1, 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, . . . It reminded her of an idiot savant, one of those people who might be grossly deficient in ordinary social or verbal skills, but who could perform mindboggling feats of mental arithmetic -- such as on what day of the week June 1, ^{in the year} 11,977 will fall. It wasn't for anything. They did it because they liked it. She was at once exhilarated and deeply disappointed. After all these years, they had finally received a signal -- sort of. But its content was ~~empty, hollow. She had imagined the~~ Encyclopaedia Galactica. ^{so shallow, compared to what she had imagined.} ✓

We've only achieved the capacity for radio astronomy in the last few decades, she reminded herself, in a galaxy where the average star is billions of years old. The chance of receiving a signal from a civilization exactly as advanced as we are should be miniscule. If they were even a little behind us, they would lack the technological capability to communicate with us at all. So the most likely signal would come from a civilization much more

advanced. Maybe they would be able to write mirror fugues: the counterpoint would be the theme written backwards. No, she decided. While this was a kind of genius without a doubt, and certainly beyond her ability, it was a tiny extrapolation from what human beings could do. Bach and Mozart had made at least brilliant stabs at it. She tried to make a bigger leap, into the mind of someone who was enormously, orders of magnitude, more intelligent than she was, ~~more~~ ^{Drunklin,} ~~smarter~~ ^{intelligent} than ~~X~~, say, or Eda, the young Nigerian physicist who had just won the Nobel Prize. But it was impossible. She could muse about demonstrating Fermat's last theorem in only a few lines of equations; she could imagine problems enormously beyond us that would be old hat to them. ~~But~~ ^{she} she couldn't get into their minds. She couldn't imagine what thinking ^{would} ~~must~~ be like if you were much smarter than a human being. ^{Of course. What did she expect?} No surprise. ^{trying} It was like ~~pretending to picture~~ ^{visualize} a new primary color, or a world in which you could recognize several hundred acquaintances individually only by their smell. . . . ~~These were~~ ^{this,} ~~only words.~~ She could talk about ~~it~~, but she couldn't experience it. By definition, ^{it has to be mighty hard to} ~~you couldn't really~~ understand the behavior of a ~~non-human~~ being much smarter than you are. Even so, ~~she kept~~ ^{even so:} ~~thinking,~~ why only prime numbers?

The Argus radioastronomers had made ~~some scientific~~ progress in the last few days. Vega had a known motion: a known component of its velocity towards or away from the Earth, and a known component laterally, across the sky, against the background of more distant stars. The ARGUS interferometer, ¹³¹ ~~a thousand~~ telescopes all working

together, had determined that the source was moving with Vega. Not only was the signal coming, as carefully as they could measure, from where Vega was in the sky; but the signal also shared the peculiar and characteristic motions of Vega. Unless this was a hoax of heroic proportions, the source of the prime number pulses was indeed in the Vega system.

"It's the goddamndest most wonderful thing I ever heard of. And it's got nothing to do with us," said an official of the Defense Advanced Research Projects Agency, preparing to return to Washington.

As soon as the discovery had been made, Ellie had assigned a ~~few~~ ^{handful} ~~dozen~~ of the telescopes to examine Vega in a range of other frequencies. And sure enough, they found the same signal, the same monotonous succession of prime numbers, beeping away in the 1420 megahertz hydrogen line, the 1667 [CHECK] megahertz hydroxyl line, and at many other frequencies. All over the radio spectrum, in an electromagnetic choreography, Vega was bleating out prime numbers.

"It doesn't make sense," said ^{Drumlin,} ~~X~~, casually touching his belt buckle. "We couldn't have missed it before. Everybody's looked at Vega. For years. Arroway observed it from Arecibo a decade ago. Suddenly, last Tuesday, Vega starts broadcasting prime numbers? Why now? What's so special about now? How come they start transmitting just a few years after Argus starts listening?"

"Maybe their transmitter was down for repairs for a ~~few~~ ^{couple of} 1 centuries, and they just got it back on line. Maybe their duty cycle is to broadcast to us just one year out of every million.

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Even Valerian, whose view of human nature was the opposite of conspiratorial, thought he had caught an undercurrent in Drumlin's last question: Could all this be a reckless, desperate attempt by Argus Scientists to prevent a premature closing down of the project?

There are all those other candidate planets that might have life on them, you know," offered Valerian. "We're probably not the only kid on the block." But Drumlin, plainly dissatisfied, only shook his head.

Between the scientists and the bureaucrats ^{also} there was a kind of a clash of fundamental assumptions, uneasiness, a mutual discomfort, what one of the electrical engineers called an impedance mismatch. The scientists were too speculative, too quantitative, and too casual about talking to anybody for the tastes of many of the bureaucrats. The bureaucrats were too ^{unimaginative,} cautious, too qualitative, too uncommunicative for many of the scientists.

Ellie and especially ^{der Heer} DeVries tried hard to bridge the gap. But the pontoons kept being swept downstream.

This night, cigarette butts and coffee cups were everywhere. The casually dressed scientists, Washington officials in summer suits, and an occasional flag rank military officer filled the ^{control} display room, the seminar room, the small auditorium, and spilled out of doors where, illuminated by cigarettes and starlight, some of the discussions continued. But tempers were a little frayed. The strain was showing.

It wasn't possible. Valerian also shook his head, and der Heer was confronted by two senior experts on the problem silently shaking their heads at one another.

"Dr. Arroway, this is Michael Kitz, Assistant Secretary of Defense for C³I."

Introducing Kitz, and positioning himself just a step behind him, ^{der Heer} DeVries was communicating . . . what? Some unlikely mix of emotions.

Bemusement in the arms of prudence? He seemed to be appealing for restraint. -- pronounced "cee-cubed-eye" -- "C³I" stood for Command, Control, Communications and

Did he think her such a hothead?

Intelligence, important responsibilities at a time when the United States and the Soviet Union were gamely making major phased reductions in their strategic nuclear arsenals. It was a job for a cautious man.

✓
Kitz settled himself in one of the two chairs across the desk from Ellie, and leaned forward. ~~He read the Kafka quote over her desk, with apparent distaste.~~ He was unimpressed.

attracted his attention, and he read it. "Dr. Arroway, let me come right to the point. We're concerned about whether it's in the best interest of the United States for

this information to be generally known. We were not overjoyed about your sending that telegram all over the world."

"You mean to China? To Russia? To India?" ^{Despite her best effort,} Her voice had a discernible edge to it. "You wanted to keep the first 1021 prime numbers secret? Do you suppose the extraterrestrials intended to communicate only with Americans? Don't you think, Mr. Kitz, that a message from another civilization belongs to the whole world?"

(1022)

"You might have asked our advice."

"And risk losing the signal? Look, for all we know, something interesting might have been broadcast when Vega had set here in New Mexico, but when it's high in the sky over Beijing. These signals aren't exactly a person-to-person call to the U.S. of A. They're not even a person-to-person call to the Earth. It's station-to-station to any planet in the solar system. We just happened to be lucky enough to pick up the phone."

~~Der Herr~~
~~Devries~~ was radiating something again. What was he saying? That he liked that elementary analogy, but ease up on Kitz? ^H "In any case," she continued,

"it's too late. Everybody knows now that there's something like intelligent life in the Vega system."

"Not really,

~~"It's not too late,~~ Dr. Arroway. You seem to think there'll be some information-rich transmission, a message, still to come. Dr.

Der Heer

~~DeVries~~ here says you think these prime numbers are an announcement, something to make us pay attention. If there is a message and it's subtle -- something those other countries wouldn't pick up right away -- I want it kept quiet until we can talk about it."

"Well, many of us have wants, Mr. Kitz," she found herself

~~Kitz was not talking nonsense, but there was something irritating, almost provocative, about the~~ saying sweetly, ignoring ~~DeVries'~~ *Der Heer's* slightly raised eyebrows. "I, for *Kitz's* ~~man's~~ manner,

example, have a want to understand what the meaning of this signal is, and what's happening on Vega, and what it means for the Earth. It's possible that scientists in other nations are the key to that understanding. Maybe we'll need their data. Maybe we'll need their brains. I could imagine this might be a problem too big for one country to handle all by itself."

Der Heer

~~DeVries~~ now appeared faintly alarmed. "Uh, Dr. Arroway. *Secretary* ~~Mr.~~

Kitz' suggestion isn't all that unreasonable. It's very possible we'd bring other nations in. All he's asking is to talk about it with us first. And that's only if there's a new message." His tone was calming ~~without approaching the frontiers of the unctuous.~~ *quite* *but not* She looked at him closely again. *Der Heer* ~~DeVries~~ was not a patently handsome man, but he had a kind and intelligent face. He was wearing a blue suit and a crisp oxford shirt, his seriousness and his air of self-possession moderated by the warmth of his smile. Why, then, was

he shilling for this jerk? Part of his job? Could it be that Kitz was talking sense, as improbable as that seemed?

"It's ~~probably~~ a remote contingency anyway," Kitz sighed as he got to his feet. "The Secretary of Defense would appreciate your cooperation." He was trying to be winning. "Agreed?"

"Let me think about it," she replied, ^{preferred} taking his hand as if it were a dead fish.

"I'll be along in a few minutes, Mike," ^{Der Heer} ~~DeVries~~ said cheerfully.

His hand on the lintel of the door, Kitz had an apparent afterthought, removed a document from his inside breast pocket, returned, and placed it gingerly on the corner of her desk. "Oh yes, I forgot. Here's a copy of the ^{Haddon} ~~Logan~~ decision. You probably know it. It's about the government's right to classify material vital to the security of the United States. Even if it didn't originate in a classified facility."

"You want to classify the prime numbers?" she asked, her eyes wide in mock incredulity.

"See you outside, Ken."

She began talking the moment Kitz left her office. "What's he after? Vegan death rays? World blower-uppers? What's this really about?"

"He's just being prudent, Ellie. I can see you don't think that's the whole story. Okay. Suppose there's some message -- you know, with real content -- and in it there's something offensive to Muslims, say, or to Methodists. Shouldn't we release it carefully, so the United States doesn't get a black eye?"

"Ken, that man is an Assistant Secretary of Defense. If ~~their~~ ^{they're} ~~worried about Muslims and Methodists~~ ^{concern wasn't military} they would have sent me an Assistant Secretary of State, ^{or -- I don't know -- one of those religious fanatics who preside at Presidential Prayer breakfasts,} You're the President's Science Advisor. What ^{did} have you advised ~~him?~~ ^{her?}"

[Does i.s. dispersion undo pol. mod? ^{Linear or circular pol.?}]

"I haven't advised ~~him~~ ^{her} anything. Since I've been here, I've only talked to ~~him~~ ^{her} once, briefly, on the phone. And, I'll be frank with you, ~~he~~ ^{she} didn't give me any instructions about classification. I thought what Kitz said was way off base. I think he's acting on his own."

"Ken, I trust you. I believe you didn't set me up for this ^{Logan Hadden} Decision threat." ^{He} She waved the document in front of her and paused, seeking his eyes. ^{Drumlin} "Do you know that ~~X~~ ^{Drumlin} thinks there's a message in the polarization?"

"I don't understand."

"Just a few hours ago, ^{Dave} ~~X~~ finished a rough statistical study of the polarization. You know that the radio wave that comes out of a telescope is linearly polarized? ^{Because} Because of the way it's transmitted, it's vibrating in a particular plane. Well, we recently discovered that the ~~plane~~ ^{polarization} is varying furiously, as if the radio wave is manically switching planes as it propagates through space. Left-right, up-down, left-right, up-down. We could make a transmitter system to modulate the polarization -- I mean it could control the wobble -- if we wanted to go ^{to} ~~through~~ the effort. You know, we have

amplitude modulation and frequency modulation, but it's just not our civilization's convention to do polarization modulation.

"Well, we don't really know that the Vega signal has polarization modulation. We're busy checking it out right now. But ~~X~~ *Dave* found that there weren't an equal number of the two sorts of linear polarization. It wasn't polarized left-right ~~exactly~~ as much as it was up-down. It's just possible that there's another message in the polarization, *that we've missed so far. That's why* so I'm suspicious. Kitz isn't just giving me general *else.* gratuitous advice. He knows we may be on to something."

"Ellie, take it easy. You've hardly slept for four days. You've been juggling the science, the administration and the press. You've already made one of the major discoveries of the century, and, *if I understand you right* you might be on the verge of something much more important. You've got every right to be a little on edge, and threatening to militarize the project was clumsy of Kitz. I don't have any trouble understanding why you're suspicious of him. But there's some sense to what he says."

"Do you know the man?"

"I've been in a few meetings with him. I can hardly say I know him. Ellie, if there's a possibility of a real message coming in, wouldn't it be a good idea to thin out the crowd a little?"

"Sure. Give me a hand with some of the Washington dead wood."

"Okay. And if you leave that document on your desk, someone'll be in here and draw the wrong conclusion. Why don't you put it away somewhere?"

"You're going to help?"

"If the situation stays anything like what it is now, I'll help. We're not going to make our best effort if this thing gets classified."

She smiled, knelt before her small office safe, punched in the six-digit combination, 314159, took one last glance at the document that was titled in large black letters "THE UNITED STATES ^{VS. HADDEN} ~~VERSUS~~ ^{LOGAN} CYBERNETICS," and locked it away. *W/A*

* * *

It was a group of about 30 -- technicians and scientists ~~of~~ ^{associated with} Project Argus, a few senior government officials, the Deputy Director of the Defense Intelligence Agency in civilian clothes, and ^{Valerian, Drumlin, DerHeer.} among them, ~~X. Y.~~ Kitz, and ~~DeVries~~. They had set up a large television projection system, focused on a screen two meters by two meters, *W* flush against the far wall. Ellie was simultaneously addressing the group and the decryption program, her fingers on the keyboard before her.

"Over the years we've prepared for the computer decryption of many kinds of possible messages. ^{due to Dr. Drumlin's analysis,} We've just learned that there's ^{is} information in the polarization modulation. All that frenetic switching between horizontal and vertical planes of polarization

means something. It's not random noise. It's as if you're flipping a coin and of course expect as many heads as tail. Instead you get twice as many heads as tails. So you conclude that the coin is

loaded,

~~weighted~~, or, in our case, that the polarization modulation isn't

Oh, look at this.

random; it has content . . . What the computer has just now told us

is even more interesting.

~~is that~~ the precise sequence of heads and tails repeats. It's a long ^{pretty} sequence, so it's a complex message, and the transmitting civilization

must want us to be sure to get it right.

"Here, you see, [?] this is the repeating message. We're now into the first repetition. Every bit of information, every dot and dash (if you want to think of them that way) is identical to what it was in the last block of data. Now we analyze the total number of bits. It's a number in the tens of billions. Okay, Bingo. It's the product of three prime numbers."

Dramlin Valerian

~~X~~ and ~~X~~ were both beaming although, it seemed to Ellie, they were experiencing quite different emotions.

"So what? What do some more prime numbers mean?" a visitor from Washington asked.

"It means, I think, we're being sent a picture. You see, this message is made of a large number of bits of information. ^{Suppose} If that

large number is the product of three smaller numbers; ~~then, of~~

~~course~~, it's a number times a number times a number. ^{So there's} ~~there are~~

three dimensions to the message. ^{I'd guess} ~~So~~ either it's a single, static

three-dimensional picture like a ^{stationary} hologram, or it's a two-dimensional

picture that changes with time -- a movie. Let's assume it's a

movie. If it's a hologram, it'll take us longer to display anyway.

We've got an ideal decryption algorithm for this one."

On the screen, they made out an indistinct moving pattern, composed of perfect whites and perfect blacks.

"Willie, put in some gray interpolation program, would you? Anything reasonable. And try rotating it about 90 degrees counterclockwise."

"Dr. Arroway, there seems to be an auxiliary sideband channel. Maybe it's the audio to go with the movie."

"Punch it up."

Ellie scanned the faces before her. Kitz looked mildly uncomfortable. Perhaps, she thought, he was anticipating some alien invader, or, worse, the design of a weapon too secret for her staff to be trusted with. Willie looked very earnest, and was swallowing over and over again. A picture is different from mere numbers. The possibility of a visual message was clearly rousing ^{amined} ~~unexplored~~ fears and fantasies in the hearts of many of the onlookers. ^{Der Haar} ~~Devries~~ had a wonderful expression on his face. For the moment, he seemed much less the official, the bureaucrat, the Presidential Advisor, ^{and much} ~~His eyes were~~ ^{more the scientist.} ~~bright in anticipation of discovery -- and, it seemed to Ellie, with something like pride in her.~~ ✓

The picture, still unintelligible, was joined by a deep rumbling glissando of sounds, sliding first up and then down the audio spectrum until it gravitated to rest somewhere around the octave below middle C. Slowly, the group became aware of faint but swelling martial music. The picture rotated, rectified, and focused.

Ellie found herself staring at a black and white grainy image of a massive reviewing stand adorned with an immense art deco eagle. Clutched in the eagle's concrete talons . . .

"Hoax! It's a hoax!" There were cries of astonishment, incredulity, laughter, mild hysteria.

"Don't you see? You've been hoodwinked," ^{Drumlin} ~~X~~ was saying to her almost conversationally. "It's an elaborate practical joke. You've been wasting all of our time."

Clutched in the eagle's concrete talons, she could ^{conveyed a modest} see clearly, ^{now} was a swastika. The camera zoomed in above the eagle to find the

smiling face of Adolf Hitler, waving to a rhythmically chanting crowd. ^{His military uniform} ~~was of extreme simplicity, devoid of military decorations,~~ The deep baritone voice of an announcer, scratchy but unmistakably speaking German, filled the room. ^{Der Herr} ~~BeVries~~ moved towards her.

^{star} ~~"You must"~~ "Do you know German?" she asked. "What's it saying?"

"The Fuehrer," he translated slowly, "welcomes the world to the German Fatherland for the opening of the 1936 Olympic Games."

Second draft

Chap. 6

~~[They never saw a human being before]~~
~~[Back to where we had been in the foggy past]~~

CS

~~Second~~
First Draft

Contact: CHAPTER SIX

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PALIMPSEST

As the plane reached cruising altitude, Albuquerque already more than a hundred miles behind them, she idly glanced at the small white cardboard rectangle imprinted with blue letters that ~~they~~ had ~~been~~ stapled to her airline ticket envelope. It read, in language unchanged since her first commercial flight, "This is not the luggage ticket (baggage check) described by Article 4 of the Warsaw Convention." Why were the airlines so worried, she wondered, that passengers might mistake this piece of cardboard for the Warsaw Convention ticket? What was a Warsaw Convention ticket? Why had she never seen one? ~~in some forgotten key event in the history of aviation,~~ Where were they storing them? Probably ~~some airline,~~ ~~some inattentive airline~~ in the distant past, had forgotten to print this caveat on ~~their~~ ~~pieces of cardboard,~~ ~~rectangles~~ and were sued into bankruptcy by irate passengers laboring under the misapprehension that this was the Warsaw ~~luggage~~ ticket. Doubtless there were sound financial reasons for this worldwide concern, never otherwise articulated, about which pieces of cardboard are not described by the Warsaw Convention. Imagine, she thought, all those lines of type devoted to something useful -- ~~the positions of~~ ~~the history of~~ ~~world exploration, say,~~ aspirants to high office on global nuclear arms reductions, say, or incidental facts of science, or even the average number of passenger miles until your ~~air~~ plane crashed.

If she had accepted ~~Devries'~~ ~~Der Heer's~~ offer of a military airplane, she would be having other casual associations. But that would have been

far too cozy, perhaps some ^{aperture} foot in the door leading to an eventual militarization of the project. They had preferred -- ^{Valerian's} eyes were already closed as he ^{finished} settled into the seat beside her -- to travel by commercial carrier. There had been no particular hurry, even after taking care of those last-minute details on the data analysis, ^{and} the hint ^{that the second} of a third layer of the onion, ^{was about to unpeel.} beginning to peel; They had been able to make a commercial flight that would arrive in Washington, ^{in fact,} in plenty of time for a good night's sleep, ^{well} before tomorrow's meeting; She glanced at the telefax system neatly zipped into a leather carrying case under the seat in front of her. It was several hundred kilobits per second faster than ^{Peter's} old model and displayed ^{much} significantly better graphics. Well, maybe tomorrow she would have to use it to explain to the President of the United States what Adolf Hitler was doing on Vega. What would her stepfather think? Did he still believe she was unsuited for science? Or her mother, now confined to a wheelchair in a nursing home? She had managed only one brief phone call to her mother since the discovery, over a week ago, and promised herself to call again tomorrow.

As she had done a hundred times before, she peered out the airplane window and imagined what impression the Earth would make on an extraterrestrial observer -- at this cruising altitude of 12 or 14 kilometers, and with eyes something like ours. There were vast ^{-- with squares, rectangles, and circles, --} areas of the Midwest intricately geometrized by those with ^A agricultural or urban passions; and, as here, vast areas of the

She was, she admitted to herself, a little nervous about the meeting. She had never met a President before, and by late Twentieth Century standards, this one wasn't half bad. And she hadn't had time to get a haircut, much less a facial. Oh well, she wasn't ^{going to the White House} there to be looked at.

Southwest in which the only sign of ~~human beings~~ ^{intelligent life} was an occasional straight line heading between mountains and across deserts. Are the worlds of more advanced civilizations totally geometrized, entirely rebuilt by their inhabitants? [?] Or would the signature of a really advanced civilization be that they left no sign at all? [?] ~~their planets maintained in full pretechnological majesty?~~ Could they tell in one swift glance (precisely at ^{which} ~~what~~ ^{passing through} stage we were ⁱⁿ some great cosmic evolutionary sequence in the development of intelligent beings?

What else could they tell? From the blueness of the sky, they could make a rough estimate of Loschmidt's number, how many molecules there were in a cubic centimeter at sea level. About three times ten to the nineteenth. Also, they could easily tell the altitudes of the clouds from the length of their shadows on the ground. If they knew that the clouds were condensed water they could roughly calculate the temperature lapse rate of the atmosphere, because the temperature had to get to about minus 40 degrees Centigrade at the altitude of the highest clouds she could see. The erosion of landforms, the dendritic patterns and oxbows of rivers, the presence of lakes and battered volcanic plugs all spoke of an ancient battle between land-forming and erosional processes. Really, you could see at a glance that this was an antique planet with a brand new civilization.

^{maybe even lifeless. A few would harbor} Most of the planets in the Galaxy would be venerable and pretechnical, ~~or ancient with~~ civilizations much older than ours.

Worlds with technical civilizations just beginning to emerge must be

spectacularly rare. It was perhaps the only quality fundamentally unique about the Earth.

Through lunch, the landscape slowly turned verdant as they approached the Plains States. You had hardly any sense of motion in modern air travel. She looked at ~~his~~ ^{Peter's} still sleeping ~~body~~ ^{form}; -- he had rejected the prospect of airline lunch with some indignation. Beyond him, across the aisle, was a very young human being, perhaps three months old, comfortably nestled in its father's arms. What was an infant's view of air travel? You go to a special place, walk into a large room with seats in it, and sit down. The room rumbles and shakes for ~~five~~ ^{four} hours. Then you get up and walk off. Magically, you're somewhere else. The means of transportation seem obscure to you. But the ^{basic} idea is easy to grasp, and precocious mastery of aerodynamics or jet engine design is not required of you.

It was late afternoon when they circled Washington, awaiting permission to land. She could make out, between the Washington Monument and the Lincoln Memorial, a vast crowd of people. It was, she had read only an hour earlier in the Times telefax, a massive rally of black Americans, protesting economic disparities and educational inequities. Considering the justice of their grievances, she thought, they had been very patient. She wondered how the President would respond to the rally and to the Vega transmission, on both of which ~~he would have to make~~ ^{official} some public comment tomorrow.

would have to be made

* * *

"What do you mean, Ken, 'They get out'?"

"I mean, Mr.^{S.} President, that our television signals leave this planet and go out into space."

"Just exactly how far do they go?"

"With all due respect, Mr.^{S.} President, it doesn't work that way."

"Well, how does it work?"

"The signals spread out from the Earth in spherical waves, a little like ripples in a pond. They travel at the speed of light -- 186,000 miles a second -- and essentially go on forever. The better some other civilization's receivers are, the farther away they could be and still pick up our TV signals. Even we could detect a strong TV transmission from a planet going around the nearest star."

For a moment, the President stood ramrod straight, staring out the French doors into the Rose Garden [CHECK]. ^{She} ~~He~~ turned towards ~~Der Heer.~~ DeVries. "You mean . . . everything?"

"Yes. Everything."

"You mean to say, all that crap on television? ~~You Get Your Ass?~~ ^{Let's Make A} Deal? ~~The car crashes? Wrestling? The pornography channels?~~ The evening news?"

"Everything, Mr.^{S.} President." ^{Der Heer} ~~DeVries~~ shook his head in sympathetic consternation.

^{"Der Heer,} ~~DeVries,~~ do I understand you correctly? Does this mean that all my press conferences, my debates, my Inaugural Address, are out there?"

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Ms.
"That's the good news, ~~Mr.~~ President. The bad news is, so are all the television appearances of your predecessor. And Dick Nixon. And the Soviet leadership. And so are a lot of nasty things your opponent said about you. It's a mixed blessing."

"Okay. Go on." The President had turned away from the French doors, and was now apparently preoccupied in the examination of a marble bust of ~~Thomas Jefferson~~ ^{Tom Paine,} newly restored from ~~a limbo in the basement of~~ ^{previous} ~~The Smithsonian Institution, to which it had been consigned by the last few Administrations~~

"Look at it this way: Those few minutes of television from Vega were originally broadcast in 1936, at the opening of the Olympic Games in Berlin. Even though it was only shown in Germany, it was the first television transmission on ~~the planet~~ ^{the} Earth with even moderate power. Unlike ordinary radio transmission in the '30s, those TV signals got through our ionosphere and trickled out into space. We're trying to find out exactly what was transmitted ~~then~~ ^{can} ~~back then~~, but, as you ~~might~~ ^{can} imagine, it'll probably take some time. Maybe that welcome from Hitler is the only fragment of the transmission they ^{were able to} picked up on Vega.

"So from their point of view, Hitler is the first sign of intelligent life on Earth. (I'm not trying to be ironic.) They don't know what the transmission means, so they record it and transmit it back to us. It's a way of saying 'Hello, we heard you.' It seems to me a pretty friendly gesture."

"Then you say there wasn't any television broadcasting until after the Second World War?"

"Nothing to speak of. There was a local broadcast in England on the Coronation of George VI, a few things like that. But ^{time in} ~~the~~ next big ^{began} ~~burst of~~ television transmission ^{occurred} in the late '40's. All those programs are leaving the Earth at the speed of light. Imagine the Earth is here," ^{Der Heer} ~~DeVries~~ gestured in the air, "and there's a little spherical wave running away from it at the speed of light, starting out in 1936. It keeps expanding and receding from the Earth. Sooner or later, it reaches the nearest civilization. They seem to be surprisingly close, only 26 light years away, on some planet of the star Vega. They record it and play it back to us. But it takes another 26 years for the Berlin Olympics to return to Earth. So the Vegans didn't take decades to figure it out. They must have been pretty much tuned, all set up, ^{They detect them, record them, and after a while instantly play them back to us.} ready to go, waiting for our first television signals. But unless they've already been here -- you know, some survey mission a ^{hundred} ~~thousand~~ years ago -- they couldn't have known we were about to invent television. So Dr. Arroway thinks this civilization is monitoring all the nearby planetary systems, to see if any of its neighbors develop high technology."

"Ken, there's a lot of things here to think about. Are you ^{those -- what do you call them, Vegans? -- you sure they} sure ~~they~~ don't understand what that television program was about?"

"^SMr. President, there's no doubt they're smart. That was a very weak signal in 1936. Their detectors have to be fantastically sensitive to pick it up. But I don't see how they could possibly understand what it means. They probably look very different from us."

A "Adolf Hitler! Ken, I don't want you to think this is just because I'm Jewish, but ~~this~~ makes me furious. Forty million people die to defeat that megalomaniac and it turns out the whole time he's been flying to the stars. ~~The Emissary from Earth.~~ He's representing us." ~~She paused and continued in a calmer voice.~~

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They must have different history, different customs. There's no way

for them to know what a swastika is or who Adolf Hitler was."

"You know, I never thought Hitler could manage that Hitler salute. ~~When he gave~~ ^{He never gave} it straight on, it was always skewed at some wacko peculiar angle. And then there was that fruity bent elbow salute. If anyone else had done his Heil Hitlers so incompetently he would've ~~probably have~~ been sent to the Russian front."

"But isn't there a difference? He was only returning the salutes of others. He wasn't Heiling Hitler."

"Oh yes he was," returned the President, and, with a gesture, ~~he~~ ^{Der Heer} ushered ~~Belvies~~ out of the Rose Room and down a corridor. Suddenly, ~~she~~ stopped and regarded the Science Advisor.

"What if the Nazis didn't have television in 1936? Then what would have happened?"

"Well, then I suppose it would be the Coronation of George VI, ^{one of the} or ~~some~~ transmissions about the New York World's Fair in 1939, if ^{any of them were} ~~that was~~ strong enough ^{be} ~~for them to receive,~~ ^{on Vega. Or} ~~or~~ some programs from the late '40's. You know, Howdy Doody, Milton Berle, the Army/McCarthy Hearings -- all those marvellous signs of intelligent life on Earth."

"Those goddamn programs are our ambassadors into space, ~~the~~ ^{the} ~~The Emissary~~ ^{From Earth.} ~~She paused a moment to savor the phrase.~~ ~~ambassadors of the human race.~~ "With an ambassador, you're supposed to put your best foot forward, and we've been sending mainly crap ~~into~~ ^{to} space for 40 years. I'd like to see the network executives come to grips with this one. And that madman Hitler, that's the first news they have about Earth? What are they going to think of us?"

~~Der Herr~~
As ~~DeVries~~ and the President entered the Cabinet Room those who had been standing in small groups fell silent, and some of those who had been seated made efforts to stand. With a perfunctory gesture, the President conveyed a preference for informality, and casually greeted the Secretary of State and an Assistant Secretary of Defense. With a slow and deliberate turn of the head, ~~his~~^{her} eyes scanned the group. Some returned ~~his~~^{her} gaze expectantly. Others, detecting an expression of minor annoyance on the President's face, averted their eyes.

"Ken, isn't that astronomer of yours here? Arrowsmith?
Arrowroot?"

"Arroway, ~~Mr.~~^{s.} President. She and Dr. ~~X~~^{Valerian} arrived last night. Maybe they've been held up in traffic."

"Dr. Arroway called from her hotel, ~~she~~^{Ms. President,} volunteered a meticulously groomed young man. "She said that there was some new data coming through on her telefax, ~~that~~^{and} she wanted to bring ~~it~~^{it} to this meeting. We're supposed to start without her."

Michael Kitz leaned forward, his tone and expression incredulous. "They're transmitting new data on this subject over an open telephone, insecure, in a Washington hotel room?"

~~Der Herr~~
~~DeVries~~ responded so softly that Kitz had to lean still further forward to hear. "Mike, I think there's at least commercial encryption on her telefax. But remember there are no security guidelines established in this matter. I'm sure that Dr. Arroway will be cooperative if guidelines are established."

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I want to impress on all of you that nothing said in this room -- I mean nothing -- is to be discussed with anyone who isn't here, except for the Secretary of Defense and the Vice President who are overseas.

"All right, let's begin," ~~the President~~ ^{Der Heer} said after the briefest

of pauses. "This is a joint informal meeting of the National Security Council and what for the time being we're calling the Special Contingency Task Group. Yesterday, Dr. ~~DeVries~~ ^{Der Heer} gave most of you a briefing on this unbelievable TV program from the star Vega. It's the view of Dr. ~~DeVries~~ ^{Der Heer} and others," she looked around the table, "that it's just a fluke that the first television program to get to Vega starred Adolf Hitler. But it's . . . ~~distasteful~~ ^{an embarrassment}. I've asked the Director of Central Intelligence to prepare an assessment of any national security implications in all of this. Is there any direct threat from whoever the hell is sending this? Are we going to be in trouble if there's some new message, and some other country decodes it first? But first let me ask, Marvin, does this have anything to do with flying saucers?"

The Director of Central Intelligence, an authoritative man in late middle age, wearing steel-rimmed glasses, summarized. Unidentified Flying Objects, called UFOs, have been of intermittent concern to the CIA and the Air Force, ^{especially in the 1950's and '60's,} in part because rumors about them might be a means for a hostile power to spread confusion ^{or} ~~and~~ to overload communications channels. A few of the more reliably reported incidents turned out to be penetrations of U.S. air space, or overflights of U.S. overseas bases, by high performance aircraft from the Soviet Union or Cuba. Such overflights are a common means of testing a potential adversary's readiness, and the United States had more than its fair share of such penetrations, and feints at

penetration, of Soviet air space. It was not good publicity that a Cuban MiG had penetrated 200 miles up the Mississippi Basin before being detected. The routine procedure had been for the Air Force to deny that any of its aircraft were in the vicinity of the UFO sighting, thus solidifying public mystification. At these explanations, the Air Force Chief of Staff looked ~~a little~~ *marginally* uncomfortable, but said nothing.

The great majority of UFO reports, the ~~Director of Central~~ *DCI* ~~Intelligence~~ continued, were ~~hoaxes or delusions~~, but mainly natural objects misapprehended by the observer. Unconventional or experimental aircraft, automobile headlights reflected off overcast, balloons, birds, luminescent insects, even planets and stars seen under unusual atmospheric conditions, had all been reported as UFOs.

A significant number of reports turned out to be hoaxes or real psychiatric delusions.
There had been more than a million UFO sightings reported worldwide since the phrase "flying saucer" had been invented in the late '40's, and not one of them seemed on good evidence to be connected with an extraterrestrial visitation. But the idea generated high emotions, and there were fringe groups and publications, and even some academic scientists, that kept alive the supposed connection between UFOs and *life on other worlds.*
Recent millennial sentiment included its share of saucer-borne extraterrestrial redeemers.
~~extraterrestrials~~. The official Air Force investigation, called in its final incarnation Project Blue Book, had been closed down in the 1960's for lack of progress, and a low level continuing interest had been maintained jointly by the Air Force and the CIA. The scientific community had been so convinced there was nothing to it that when Jimmy Carter requested the National Aeronautics and Space

Administration to make a comprehensive study of UFOs, NASA uncharacteristically refused a Presidential request.

"In fact," interjected one of the scientists at the table, unfamiliar with the protocols in meetings such as this, "this UFO business has made it more difficult to do serious SETI work."

"All right," the President sighed. "Is there anybody around this table who thinks that UFOs and this signal from Vega have anything to do with each other?" ^{Der Hoer} ~~Devries~~ inspected his fingernails. No one spoke. "Just the same, there's going to be an awful lot of I-told-you-so's from the UFO yo-yo's. Marvin, why don't you

continue?"

There were a few earlier TV transmissions but all at very low power levels. Secretary of Commerce Herbert Hoover made a brief television appearance on ... April 27, 1927. Anyway, the German

We did it before the Germans.

"In 1936, Mr. President, a very faint television signal transmits the opening ceremonies of the Olympic Games to a handful of television receivers in the Berlin area. It's an attempt at a public relations coup. It shows the progress and superiority of German technology. The signal leaves the Earth at the speed of light, and 26 years later arrives on Vega. They sit on the signal for a few years -- whoever 'they' are -- and then send it back to us hugely amplified. Their ability to receive that very weak signal is impressive, and their ability to return it at such high power levels is impressive. There certainly are security implications here. The electronic intelligence community, for example, would like to know how such weak signals can be detected. Those people, or whatever they are, on Vega are certainly more advanced than we are -- maybe only a few decades further along, but maybe much further along than that.

"They've given us no other information about themselves -- except ~~that~~, at some frequencies, ~~the ARGUS astronomers have demonstrated that~~ the transmitted signal doesn't show the Doppler effect from the motion of their planet around their star. They've simplified that data reduction step for us. They're . . . polite. So far, nothing of military or any other interest has been received. All they've been saying is that they're good at radio astronomy, they like prime numbers, and they can return our first TV transmissions back to us. It couldn't hurt any other nation to know that. And, remember that all those other countries are receiving this same three-minute Hitler clip, over and over again. ^{They just haven't figured out how to read it yet.} The Russians or the Germans or someone is likely to tumble to this polarization modulation sooner or later. My personal impression, ~~Mr.~~^{F.} President -- I don't know if State agrees -- is it would be better if we released it to the world, before we're accused of covering something up. If the situation remains static -- with no big change from where we are right now -- we could think about making a public announcement, or even releasing that three-minute film clip.

"Incidentally, we haven't been able to find any record from German archives of what was ~~on~~ⁱⁿ that original broadcast. We can't be absolutely sure that the people on Vega haven't made some change in the content before sending it back to us. We can recognize Hitler, all right, and the part of the big Olympic stadium we see corresponds accurately to Berlin in 1936. But if, at that moment, Hitler had ^{really been} scratched ^{ing} his mustache instead of smiling as in ~~the~~^{that} transmission, we'd have no way to know."

At this moment, Ellie, followed by ^{Valerian,} ~~Y~~, arrived slightly breathless, and attempted to take an obscure chair against the wall. ^{Der Heer} ~~Devries~~ noticed and directed the President's attention to her.

"Dr. Arrow-uh-way? I'm glad to see you've arrived safely. First, let me congratulate you on a splendid discovery. Splendid. Um, Marvin. . . "

"I've reached a stopping point, ^S ~~Mr.~~ President."

"Good. Dr. Arroway, we understand you have something new. Would you care to tell us about it?"

"^S ~~Mr.~~ President, ~~gentlemen~~, sorry to be late, but I think we've just hit the cosmic jackpot. Let me try and explain it this way: In classical times, when parchment was in short supply, people would write over an old parchment, making what's called a palimpsest. There was writing under writing under writing. This signal from Vega is, of course, very strong. As you know, there's the prime numbers, and 'underneath' them, this eerie Hitler business. But underneath the sequence of prime numbers, underneath the retransmitted Olympic broadcast, we've just uncovered an incredibly rich message -- at least we're pretty sure it's a message. As far as we can tell, it's been there all along. We've just detected it.

"What does it say?" the President asked. "What's it about?"

"We haven't the foggiest idea, ^S ~~Mr.~~ President. Some of the people at Project Argus tumbled to it early this morning Washington time. We've been working on it all night."

"Over an open phone?" asked Kitz.

"With standard commercial encryption." Ellie looked a little flushed. Opening her telefax case, she quickly generated a transparent printout, and, with an overhead projector, cast its image against a screen.

"Here's all we know up to now: We'll get a block of information comprising about a thousand bits. There'll be a pause, and then the same block will be repeated, bit for bit. Then there'll be another pause, and we'll go on to the next block. It's repeated as well. The repetition of every block is probably to minimize transmission errors. They must think it's very important that we get whatever it is they're saying down accurately. ^{Now,} ~~Let's~~ call each of these blocks of information a page. ARGUS is picking up a few dozen of these pages a day. But we don't know what they're about. They're not a simple picture code like the Olympic message. This is something much deeper and much richer. It appears to be, for the first time, information they've generated. The only clue we have so far is that the pages seem to be numbered. At the beginning of every page there's a number in binary arithmetic. See this one here? And every time another pair of identical pages shows up, it's labeled with the next higher number. Right now we're on page . . . 10,413. It's a big book. Calculating back, it seems that the message began about three months ago. We're lucky to have picked it up as early as we did."

"I was right, wasn't I," whispered Kitz to ^{Der Heer} ~~Devries~~. "This isn't the kind of extraterrestrial message you want to give to the ^{Japanese} ~~French~~ or the Chinese or the Russians, is it?"

"Is it going to be easy to figure out?" the President asked over the whispering Kitz.

"We will, of course, make our best efforts. And it probably would be useful to have the National Security Agency work on it also. But without an explanation from Vega, without a primer, my guess is that ^{we} we're not going to make much progress. It certainly doesn't seem to be written in English, or German, or any other Earthly language. Our hope is that the message will come to an end, maybe on page 20,000 or page 30,000, and then start right over from the beginning, so we'll be able to fill in the missing parts. Maybe before the whole message repeats, there'll be a primer, a kind of McGuffey's Reader, that will enable us to understand the Message."

"If I may, Mr. ^{Valerian} President . . . "

"Mr. ^{Peter Valerian} President, this is Dr. ^{Valerian} of the California Institute of Technology, one of the pioneers in this field."

"Please go ahead, Dr. ^{Valerian} ~~Y~~"

"Think of it this way: This is an intentional transmission to us. They know we're here. They have some idea, from having intercepted our 1936 broadcast, of where our technology is, of how smart we are. They wouldn't be going to all this trouble if they didn't want us to understand the message. Somewhere in there is the key to help us understand it. It's only a question of accumulating all the data and analyzing it very carefully."

"Well, what do you suppose the Message is about?"

"I don't see any way to tell, Mr. President. I can only repeat what Dr. Arroway said. It's an intricate and complex message. The transmitting civilization is eager for us to receive it. Maybe all this is one small volume of the Encyclopaedia Galactica. The star Vega is about three times more massive than the Sun and about a hundred times brighter [CHECK]. Because it burns its nuclear fuel so fast it has a much shorter lifetime than the Sun. . . "

"Yes. Maybe something's about to go wrong on Vega," the Director of Central Intelligence interrupted. "Maybe their planet will be destroyed. Maybe they want someone else to know about their civilization before they're wiped out."

"Or," offered Kitz, "maybe they're looking for a new place to move to, and the Earth would suit them just fine. Maybe it's no accident they chose to send us a picture of Adolf Hitler."

"Hold on. There's a lot of possibilities, but not everything is possible. There's no way for the transmitting civilization to know whether we've received the message, much less whether we're making any progress in decoding it. If we find the message offensive we are not obliged to reply. And even if we did reply, it would be 26 years before they received the reply, and another 26 years before they can answer it. The speed of light is fast but it's not infinitely fast. We're very nicely quarantined from Vega. And if there's anything that worries us about this new message, we have decades to decide what to do about it. Let's not panic quite yet." She enunciated these last words while offering a pleasant smile to Kitz.

"I appreciate those remarks, Dr. Arroway," returned the President. "But things are happening fast. Too damn fast. And there are too many maybes. I haven't even made a public announcement about all of this. Not even the prime numbers, never mind the Hitler ~~business~~ ^{bullcrap} message. And now we have to think about this "book" you say they're sending. And because you scientists think nothing of talking to each other, the rumors are flying. Phyllis, where's that file? Here, look at these headlines." *(all carried the same message, with minor variations in journalistic artistry)*

Brandished successively at arm's length, they ~~read~~ ^{Bug-Eyed Monsters} "Space Doc Says Alien Signals From Stars", "Astronomical Telegram Hints at Extraterrestrial Intelligence", "Voice From Heaven?", and "The Aliens are Coming! The Aliens are Coming!" ^{She} He let the newspapers flutter to the table. *"I think we'd better curtail this meeting, and reconvene at least the Hitler story hasn't broken yet."*

"If I may, Mr. President," ^{Der Hoer} ~~DeVries~~ interrupted haltingly, with evident reluctance. "I beg your pardon, but there are some international implications that I think have to be raised now."

The President merely exhaled, acquiescing. ^{Der Hoer} ~~DeVries~~ continued.

"See if I have this right, Dr. Arroway. Every day the star Vega rises over the New Mexico desert, and ^{then} you get whatever page of this complex transmission -- whatever it is -- they happen to be sending to the Earth at the moment. Then, eight hours later or something, the star sets. Right so far? Okay. Then the next day the star rises again in the east, but you've lost some pages during the time you weren't able to look at it, after it had set the previous night. Right? So it's as if you were getting pages ³⁰ ~~40~~ ⁵⁰ ~~60~~ 43 through 56 and

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~~Evidently~~ ^{Evidently}, the White House was opposed to the obliquity of the Earth. ~~was~~ The axis of this globe was ramrod vertical.

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then pages ⁸⁰~~89~~ through ¹⁰⁰95, and so on. No matter how patiently we observe, we're going to have enormous amounts of information missing. ^{Gaps.} Even if the message eventually repeats itself, we're going to have ~~missing information.~~ ^{Gaps.}

"That's entirely right." She arose and approached an enormous globe of the world. Tentatively, ^{she gave} giving it a spin. "The Earth turns. You need radio telescopes distributed evenly over many longitudes if you don't want ~~any missing information.~~ ^{Gaps.} Any one nation observing on its own is going to dip into the message and dip out -- maybe even at the most interesting parts."

"But we don't have to be tied to the surface of the Earth," interjected an Air Force General. "We can beat the rotation period. All we need is a large radio telescope in Earth orbit."

"All right." The President again glanced around the table. "Do we have a space radio telescope? How long would it take to get one up? Who knows about this? Dr. Garrison?"

The NASA Administrator, a thin, sallow, friendly man, blinked.

"Uh, no, ^{S.}Mr. President. We've submitted a proposal ~~called~~ ^{for the} Maxwell Observatory in each of the last three fiscal years, but OMB has removed it from your budget each time. We have ^{a detailed design study,} ~~the plans,~~ of course, but it would take years -- well, two years anyway -- before we could get it up. And I feel I should remind everybody that until last fall the Russians had a working millimeter and submillimeter wave telescope in Earth orbit. We don't know why it failed, but they'd be in a better position to send some cosmonauts up to fix it than we'd be to build and launch one from scratch."

"That's it?" the President asked. "NASA has an ordinary telescope in space but no radio telescope. What about the intelligence community? National Security Agency? Nobody?"

"So, just to follow this line of reasoning," ^{Der Heer} ~~DeVries~~ went on, "it's a strong signal and it's on lots of frequencies. After Vega sets over the United States, there are radio telescopes in half-a-dozen countries that are detecting and recording the signal. They're not as sophisticated as Project Argus, and they probably haven't figured out the polarization modulation yet. If we wait to prepare a space radio telescope and launch it, the message might be ended by then, disappeared altogether. So doesn't it follow that the only solution is ^{immediate} ~~urgent~~ cooperation with a number of other nations, Dr. Arroway?"


"I don't think any nation can accomplish this project alone. It will require many nations, spread out pretty evenly in longitude, all the way around the Earth. It will involve every major radio astronomy facility now in place -- the big radio telescopes in Australia, China, India, the Soviet Union, and Western Europe. We can't have any ^{gaps} ~~holes~~ in the coverage because some critical part of the Message might come when there's no telescope looking at Vega. We'll have to do something about the Eastern Pacific between Hawaii and Australia and maybe something about the Mid-Atlantic also."

"Well," the Director of Central Intelligence responded grudgingly, "the Soviets have several satellite tracking ships which are good in S-band and X-band, the ^{Motorista} ~~Akademik~~ Keldysh, for example.

~~[Aleksandrov?]~~ If we make some arrangement with them, they might be able to station ~~those~~ ships in the Atlantic or the Pacific and fill in the gaps."

Ellie pursed her lips to respond, but the President was already talking.

"All right, Ken. You may be right. But I say again this is moving too damn fast. There are some other things I have to attend to right now. I'd appreciate it if the Director of Central Intelligence and the National Security Staff could work overnight on whether we have any options besides cooperation ^{with other countries — especially countries that aren't our allies.} I'd like the Secretary of State to prepare, in cooperation with the scientists, a contingency list of nations and individuals to be approached if we have to cooperate, and some assessment of consequences. Is some nation going to be mad at us if we don't ask them to listen? Can we be blackmailed by somebody who promises the data and then holds back? Should we try to get more than one country at each longitude? Work through the implications. And for Chrissake," ^{her} ~~his~~ eyes moved from face to face around the long ~~or I'll have your cojones. You too, Arroway.~~ polished table, "keep quiet about this, We've got problems enough."



Second Draft

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THE ETANOL CONTENT OF W-3

She had planned to meet Vaygay's plane in Albuquerque and drive him back to the Argus facility in the Thunderbird. The rest of the Soviet delegation would have traveled in the observatory cars. She would have enjoyed speeding to the airport in the cool dawn air, perhaps again past an honor guard of rampant coney. And she had been anticipating a long substantive, ~~and~~ private talk with Vaygay on the return. But the new security people from the General Services Administration had vetoed the idea. Media attention and the President's sober announcement at the end of ^{her} ~~his~~ press conference two weeks before had brought enormous crowds to the isolated desert site. There was a potential for violence, they had told ^{Ellie.} ~~her~~. She must in future travel only in government cars, and then only with discreetly armed escorts. Their little convoy was wending its way towards Albuquerque at a pace so sober and responsible that she found her ^{of its own volition} right foot ^A depressing an imaginary accelerator on the rubber mat before her.

^{at} It would be good to ^{see} ~~spend some time with~~ Vaygay again. She had last seen him in Moscow three years before, during one of those ~~intermittent~~ periods in which he was forbidden to visit the West. Permission for foreign travel had waxed and waned through the decades, in response to changing policy fashions and Vaygay's ^{unpredictable} own behavior.

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Permission would be denied him after some mild political provocation about which he seemed unable to restrain himself, and then granted again when no one of comparable ability could be found to flesh out ~~the~~ ^{some} scientific delegation. He received invitations from all over the world for lectures, seminars, colloquia, conferences, joint study groups and international commissions. As a Nobel Laureate in physics, and as a full member of the Soviet Academy of Sciences, he could afford to be a little more independent than most. He often seemed poised precariously at the outer limits of the patience and restraint of the governmental orthodoxy.

His full name was Vasily Gregorovich Lunacharsky, known throughout the global community of physicists as Vaygay after the initials of his first name and patronymic. His fluctuating and ambiguous relations with the Soviet regime puzzled her and others in the West. He was a distant relative of Anatoly Vasilyevich Lunacharsky, an old Bolshevik colleague of Gorky, Lenin and Trotsky, People's Commissar for Education in 1917, and Soviet Ambassador to Spain during the Civil War [1933, CHECK]. His mother had been Jewish. He had, it was said, worked on Soviet nuclear weapons, although surely he had been too young to have played much of a role (even in the fashioning) of the first Soviet thermonuclear explosion. Once, during a vigorous discussion on the relative merits of the two political systems, Ellie had boasted that she had been free to march in front of the White House protesting American involvement in the Viet Nam War. Vaygay replied that in the same period he had been

equally free to march in front of the Kremlin protesting American involvement in the Viet Nam War.

His institute was well-staffed and well-equipped, and his scientific productivity was prodigious, indicating at most infrequent distractions by the Committee for State Security. Despite the ebb and flow of permission for foreign travel, he had been a frequent attendee at major international conferences including the "Rochester" conferences on high-energy physics, the "Texas" meetings on relativistic astrophysics, and the informal but occasionally influential "Pugwash" scientific meetings on ways of reducing international tension.

In the 1960s, she had been told, Vaygay visited the University of California at Berkeley, and was delighted with the proliferation of irreverent, scatological, and politically outrageous slogans imprinted on inexpensive buttons. You could, she recalled with faint nostalgia, size up someone's most pressing social concerns at a glance. Buttons were also popular and fiercely traded in the Soviet Union, but usually they celebrated the "Dynamo" soccer team, or one of the successful spacecraft of the Luna series, which had been the first spacecraft to land on the Moon. The Berkeley buttons were different. He had bought dozens of them, but delighted in wearing one in particular. It read, "Pray for Sex." He even displayed it at a few scientific meetings. When asked about its appeal, he would say, "In your country, it is offensive in only one way. In my country, it is offensive in two independent ways." If pressed further he would only comment that his

famous Bolshevik relative had written a book on the place of religion in a socialist society. Since then, his English had improved enormously (much more than Ellie's Russian), and his propensity for wearing offensive lapel buttons had ^{sadly,} diminished.

He had never been inclined, say, to photograph the garbage scows burdened with malodorous refuse and squawking seagulls, lumbering in front of the Statue of Liberty, as another Soviet scientist had when for fun she had ~~taken~~ ^{escorted} him on the Staten Island Ferry during a break in a meeting in New York City. Nor had he, as had some of his colleagues, ardently photographed the tumbledown shanties and corrugated metal huts of the Puerto Rican poor, during a bus excursion from a luxurious beachfront hotel to the Arecibo Observatory. Who did they submit these pictures to, Ellie wondered. She conjured up some ^{dedicated to} vast KGB library ~~on~~ the infelicities, injustices and contradictions of capitalist society. Did it warm them, when disconsolate with some of the failures of Soviet society, to browse through the fading snapshots of their imperfect American cousins?

There were many brilliant scientists in the Soviet Union who, for unknown offenses, had not been permitted out of Eastern Europe in decades. Konstantinov, for example, had never been to the West until the middle 1960s. When, at an international meeting in Warsaw, over a table encumbered with dozens of depleted Azerbaijani brandy snifters, their missions completed, Konstantinov was asked why, he replied, "Because the bastards know, they let me out, I never come back." Nevertheless, they had let him out, sure enough, during the thaw in

scientific relations between the two countries in the late '60s and early '70s, and he had come back every time. But now they let him out no more, and he was reduced to sending his Western colleagues New Year's cards, in which he portrayed himself forlornly crosslegged, head bowed, seated on a sphere below which was the Schwarzschild equation for the radius of a black hole. He was in a deep potential well, he would tell visitors to Moscow in the metaphors of physics. They would never let him out again.

In the middle of Watergate, Vaygay never asked his American colleagues how it was possible for a Federal District ^{[Appeals?] Court} Judge to defy a President, although his Soviet colleagues, almost to a man, shook their heads and tut-tutted in ^{distress} ~~amazement~~ at it. "Even the President must obey the law," Ellie would explain. Most of them would look at her in some bafflement, trying to understand so unpredictable and disorderly a society. Earlier, Vaygay would ask about the meaning of signs reading "Impeach Earl Warren," and would inquire about how many blacks and women were members of the National Academy of Sciences. But she had the sense that he was genuinely interested, that he was not trying to make a propaganda point, that he was attempting to understand this alien culture that had grown up half way around the world. He would volunteer that very few Soviet citizens of Moslem or Asiatic backgrounds were members of the Soviet Academy of Sciences, and almost no women. These injustices were, to first order, ^{between the two countries.} symmetrical. In response to questions, he would say that the official Soviet position had been that the Hungarian revolution of 1956 was

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organized by cryptofascists, and that the ~~Czechoslovakian~~ ^{Prague Spring} spring of 1968 was ~~made~~ ^{brought about} by an unrepresentative anti-socialist group in the leadership. But, he would add, if what he had been told was mistaken, if these were genuine popular uprisings, then his country had been wrong in suppressing them. On Afghanistan, he did not even bother quoting the official justifications. Once, in his office at the Institute, he had insisted on showing Ellie his personal ^{short-wave} radio, on which were frequencies labeled London and Paris and Washington, neatly spelled out in Cyrillic letters. He was free, he told her, to listen ^{the} to propaganda of all nations.

There had been a time when many of his fellows had surrendered to national rhetoric about the yellow peril. "Imagine the entire frontier between China and the Soviet Union occupied by Chinese soldiers, shoulder to shoulder, an invading army," they had asked her around the samovar in the Director's office at the Institute. "How long would it be, with the present Chinese birthrate, before they all passed over the border?" And the answer would be pronounced, in an unlikely mix of dark foreboding and arithmetic delight, "Never." William Randolph Hearst would have felt at home. But not Lunacharsky. Stationing so many Chinese soldiers on the frontier would automatically ^{reduce} ~~lower~~ the birthrate, ~~precipitously~~, he argued. Their calculations were therefore in error. He had phrased it as though the misuse of mathematical models was the subject of his disapproval, but few mistook his meaning. In the worst of the Sino-Soviet tensions, he had never, so far as Ellie knew, allowed himself to be swept up in the paranoia and racism of some of his fellows.

Ellie loved the samovars and could understand the Russian affection for them. Their Lunakhod, the successful unmanned lunar rover that looked like a bathtub on wire wheels, seemed to her to have a little samovar technology somewhere in its ancestry. Vaygay had once taken her to see a model of Lunakhod in a sprawling exhibition park outside of Moscow on a splendid June morning. There, next to a building displaying the wares and charms of the Tadzhik Autonomous Republic, was a great hall filled to the rafters with full-scale models of Soviet civilian space vehicles. Sputnik 1, the first orbiting spacecraft in human history; Luna ____, the first spacecraft to photograph the far side of the Moon; Venera ____, the first spacecraft to land on the surface of Venus; and _____, the first manned spacecraft, that carried Hero of the Soviet Union Cosmonaut Yuri __ Gagarin on a single orbit of the Earth. Outside, children were using the fins of the Vostok launch booster as slides, their pretty blond curls and red Komsomol neckerchiefs flaring as, to much hilarity, they descended to land. "Zemlya," it was called in Russian. The large Soviet island in the Arctic Sea was called Novaya Zemlya, New Land. It was there that, in ^{1961,} ~~the 1950s~~, they had detonated a 58 megaton thermonuclear weapon, the largest single explosion ever ^{so far} ~~contrived~~ ~~devised~~ by the human species. But on that spring day, with the vendors hawking the ice cream in which Moscovites take so much pride, with families on outings and a toothless old man smiling at Ellie and Lunacharsky as if they were lovers, the old land had seemed nice enough.

In her infrequent visits to Moscow or Leningrad, Vaygay would often arrange the evenings. A group of six or eight of them would go to the Bolshoi or the Kirov ballet. Lunacharsky somehow would arrange ^{for} the tickets. She would thank her hosts for the evening, and they -- explaining that it was only with foreign visitors that they themselves were able to attend such performances -- would thank her. Vaygay would only smile. He never brought his wife, and Ellie had never met her. She was, he said, a physician who was devoted to her patients. There was only one other remark about his immediate family that she could remember him making. She had asked him what his greatest regret was, because his parents, when young, had not, as they ^{had} once contemplated, emigrated to America. (This was early in their relationship, and she had not phrased the question with much delicacy.) ^{I have regret} "Just one," he had said thoughtfully, in his gravelly voice. "My daughter married a Bulgarian."

Once he arranged a dinner at a Caucasian restaurant in Moscow. A professional toastmaster ^{or "tamada"} named Khaladze had been engaged for the evening. The man was brilliant in the subtlety and generosity of his toasts -- although her Russian was bad enough that she was obliged to ask that most of the toasts be translated. An early and comparatively mediocre ^{toast} ~~one~~ had ended "To peace on all planets," and Vaygay explained ~~to her~~ that the word "mir" meant both peace and a self-governing community of peasant households that went back to ancient times. They had talked about whether the world had been more peaceful when its largest political units had been no larger than

^{forgetting} He turned to her and, explaining the rest of the evening, remarked "We call the man who drinks without a toast an alcoholic."

tumbler high.
villages. "Every village is a planet," Lunacharsky had said, "And every planet ~~is~~ a village," she had returned.

[Synonym?]
Such gatherings would be a little raucous. A great deal of brandy and vodka would be drunk, but no one ever seemed seriously inebriated. They would ~~come out of~~ ^{emerge noisily out of} the restaurant at one or two in the morning and try, often vainly, to find a taxicab. Several times he had escorted her on foot a distance of five or six kilometers from the restaurant back to her hotel. He was attentive, a little avuncular, tolerant in his political judgments, fierce in his scientific pronouncements, and never, although his sexual escapades were legendary among his colleagues, did he ~~ever~~ permit himself so much as a goodnight kiss with Ellie. This had always distressed her a little, although his affection for her was plain.

There were many women in the Soviet scientific community, proportionately more so than in the United States. But they tended to occupy menial to middle level positions, and male Soviet scientists, like their American counterparts, were puzzled about a pretty woman with evident scientific competence who expressed her views vigorously. Some would, ~~almost unconsciously~~ ^{here as in the rest of the world,} interrupt her or

^{more than others,}
pretend not to hear her. And Lunacharsky would always, as ~~DeVries~~ ^{Der Herr} ~~often~~ would in a comparable situation, lean over and ask in a louder voice than usual, "What did you say, Dr. Arroway? I didn't quite manage to hear." The others would then fall silent and she would continue about doped gallium arsenide detectors, or the ethanol content of the galactic cloud W-3. The quantity of 200 proof alcohol in this single

interstellar cloud was more than enough to maintain the present population of the Earth, if every adult were a dedicated alcoholic, for the age of the solar system. The ~~Georgian~~^{+amada} toastmaster had appreciated the remark. In their subsequent toasts, they had speculated on whether very different life forms would be intoxicated by ethanol, whether public drunkenness was a galaxy-wide problem, and whether a toastmaster on any other world could be as skillful as our Trofim Sergeivich Khaladze.

* * *

They arrived at Albuquerque airport to discover that, miraculously, the commercial flight from New York with the Soviet delegation aboard had landed a half hour early. Ellie found Vaygay at at airport souvenir shop negotiating the price of some trinket. He must have seen her out of the corner of his eye. Without turning to face her, he lifted a finger: "One second, Arroway. \$19.95?" he continued to the elaborately disinterested salesclerk. "I saw the identical set in New York yesterday for \$17.50." She edged closer and observed Vaygay spreading a set of holographic playing cards, displaying nudes of both sexes in poses, now considered merely indecorous, that would have scandalized the previous generation. The clerk was making halfhearted attempts to gather the cards up as Lunacharsky made vigorous and successful efforts to cover the counter with the cards. Vaygay was winning. "I'm sorry, sir, I don't set prices. I only work here," complained the clerk.

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"You see the deficiencies of a planned economy," he turned to Ellie while proffering a 20 dollar bill to the clerk. "In a true free enterprise system, I could probably purchase this for \$15.00. *Maybe \$12.95.* Don't look at me so ~~quizzically~~ *peculiarly,* Ellie. This is not for me. *You see,* ~~Holograms are only a small step closer to reality.~~ With the jokers there are 54 cards here. ~~Every one~~ *Each* of them will make a nice gift for some worker at my Institute." She smiled and took his arm.

"It's good to see you again, Vaygay."

"An infrequent delight, my dear."

On the drive to Soccoro, by mutual but unspoken agreement, they talked mainly pleasantries. ~~X~~ *Valerian* and the driver, one of the new security people, were in the front seats. ~~X~~ *Peter,* not a voluble man even in ordinary circumstances, was content to lean back and listen to their conversation which touched only tangentially on the issue the Soviets had come to discuss: the third level of the palimpsest, the elaborate, complex, and still undecoded message they were receiving. The U.S. government had, more or less reluctantly, concluded that Soviet participation was essential. This was true especially because the signal from Vega was so intense that even modest radiotelescopes could detect it, ~~and~~ *and* years before, the Soviets had prudently deployed a ~~large~~ number of small dishes across the entire Eurasian land mass, stretching 25,000 kilometers [CHECK] around the surface of the Earth.

In addition, Soviet ocean-going satellite tracking vessels were patrolling both the Atlantic and the Pacific. Some of the Soviet data was redundant, because observatories in Japan, China, India and Iraq were recording the signals as well. Indeed, every substantial radiotelescope in the world that had Vega in its sky was listening. Astronomers in Britain, France, The Netherlands, Sweden [CHECK.], Germany, and Czechoslovakia, in Canada and Venezuela, in Australia and South Africa [CHECK. VERY IMPORTANT.] were recording small pieces of the message, following Vega from ~~when it rose to when it set.~~ *starrise to starset.* In some observatories the detection equipment was not sensitive enough even to make out the individual pulses. They listened anyway to ~~the blurred~~ *an audio blur.* ~~message.~~ All these nations had a piece of the jigsaw puzzle because, as Ellie had reminded Secretary Kitz, the Earth turns. Every nation tried to make some sense out of the impulses. But it was very difficult. No one could tell even if it was written in symbols or in pictures.

It was perfectly conceivable that they would not decrypt the message until it cycled back to page 1 and began again with the introduction, the primer, the decoding key. Maybe it was a very long message, Ellie thought as Vaygay compared taiga with scrub desert; ~~Maybe~~ *Maybe* it wouldn't cycle back for a hundred years. Or maybe there was no primer. Maybe the Message ~~(the word was now beginning to be capitalized)~~ *all over the planet,* ^{so} *worlds* was an intelligence test, ~~and~~ *would be unable* ^{misuse} those too stupid to decrypt it ~~were not entitled~~ *misuse* to its contents. It suddenly struck her what a humiliation she would feel for the human species if, in the

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end, they failed to understand the Message. The moment the Americans and the Soviets decided to collaborate, and the Memorandum of Agreement solemnly signed, every other nation with a radiotelescope agreed to cooperate. There was a kind of World Message Consortium, and people were actually talking in those terms. They needed one another's data, and they needed one another's brain power if the Message was to be decrypted. ✓

The newspapers were full of little else. The pitiful ^{Few Facts} ~~little~~ that ^{were} ~~was~~ known -- the prime numbers, the Olympic broadcast, the existence of a complex message -- were endlessly reviewed. There were few people on the planet who had not heard about the Message from Vega. Religious sects, established and marginal, some newly invented for the purpose, were dissecting the theological implications of the Message. Some thought it was from God, and some from the Devil. Astonishingly, some were even unsure. There was a nasty resurgence of interest in Hitler and the Nazi regime, and Vaygay mentioned to her that he had found a total of eight swastikas in the advertisements in that ^{Ellie thought that eight was about par before the transmission had been received.} Sunday's New York Times Book Review. There were those who considered ^{to the signal} ~~the~~ listening an abomination, and urged the observatories to stop; there were those who considered it a ^{Token} ~~Sign~~ of the Advent, and urged the construction of still larger radiotelescopes, some of them in space. There were those who cautioned against paying attention to the Soviet data, on grounds that it might be falsified or fraudulent (although in the longitudes of overlap it agreed well with the Iraqi, Indian, Chinese and Japanese data). And there were those who sensed a change in the world political climate, and contended that the very existence

of the Message, even if it were never decoded, was exercising a benign influence on the ~~contending~~^{quarrelsome} nation states. Since (a) the transmitting civilization was clearly more advanced than ours; and (b) it clearly, at least as of 26 years ago, had not destroyed itself, it followed, some argued, that technological civilizations did not inevitably self-destruct. In a world gingerly experimenting with major divestitures of nuclear weapons and their delivery systems, the Message was taken by many as a token of hope.

Those with predispositions favoring such ~~a~~ cheerful prognosⁱs found themselves edging uncomfortably towards ground that had been occupied for a decade by the chiliastic movement. Some chiliasts held that the imminent arrival of the ~~Third~~^A Millenium would be accompanied by the return of Jesus or Buddha or The Prophet, who would establish on Earth a benevolent theocracy, severe in its judgment of mortals. Perhaps this would prelude the mass celestial ~~ascent~~^A of the Elect. But there were other chiliasts, and there were far more of these, who held that the physical destruction of the world was the indispensable prerequisite for the Advent; this had been unerringly foretold in various otherwise mutually contradictory ancient prophetic works. The Doomsday Chiliasts were uneasy with the whiff of world community in the air, and troubled by the steady annual decline in the global stockpiles of strategic weapons. The most readily available means for fulfilling the central tenet of their faith were being disassembled day by day. Other candidate catastrophes -- overpopulation, industrial pollution, earthquakes, volcanic explosions, greenhouse

warming, ice ages, or cometary impact with the Earth -- were too slow, too improbable, or insufficiently apocalyptic for the purpose. Some of their leaders had assured ~~cheering crowds~~ *mass rallies of devoted followers* that, except for accidents, life insurance was a token of wayward faith; that, except for the very elderly, to purchase a gravesite or make funeral arrangements in other than urgent necessity was deeply impious. All who believed would be raised bodily to Heaven, would stand before the throne of God, in only a few years.

Ellie knew that Lunacharsky's famous relative had been that rarest of beings, a Bolshevik revolutionary with a scholarly interest in the world's religions. But the attention Vaygay directed to the growing worldwide theological ferment was apparently muted. "The main question," he said, "is whether the Vegans have properly denounced Leon Trotsky."

As they approached the Argus site, the roadside became dense with parked automobiles and campers, and great crowds of people. At night, the once tranquil plains of San Augustin were illuminated by hundreds of campfires. The people along the highway were by no means all well-to-do. She noticed two young couples. The men were in T-shirts and worn jeans, belted around their hips, swaggering a little as they had been taught by their seniors upon entering high school, talking

animatedly. One of them pushed a ragged stroller, in which sat a carefree boy about two years old. The women followed behind their husbands, one of them holding the hand of a toddler new to the human art of walking, and the other cantilevered forward with what in another month or two would be a further life born on this obscure planet. ⁹⁷ There were mystics from sequestered communities outside Taos, who used psilocybin as a sacrament, and nuns from a convent near Albuquerque who used ethanol for the same purpose. There were leather-skinned, crinkly-eyed men who had spent their whole lives under the open sky, and bookish, sallow-faced students from the University of Arizona in Tucson. There were silk cravats and burnished silver string ties sold by Navajo entrepreneurs at exorbitant prices, a small reversal of the historical commercial relations between whites and Native Americans. Chewing tobacco and bubble gum were being vigorously employed by enlisted men on leave from Davis-Monthan [CHECK] Air Force Base. An elegantly attired, white-haired man in a \$600 suit with a color-coordinated Stetson was, just possibly, a rancher. There were people who lived in barracks and skyscrapers, in adobe hovels, in dormitories, in trailer parks. Some came because they had nothing better to do, some because they wanted to tell their grandchildren that they had been there. Some arrived hoping for failure, others confident of witnessing a miracle. Sounds of quiet devotion, raucous hilarity, mystic ecstasy, and subdued expectation rose from the crowd into the brilliant afternoon sunlight. A few heads glanced incuriously at their automobiles, marked "U.S. Government Interagency Motor Pool."

Some people were lunching on the tailgates of hatchbacks, others sampling the wares of itinerant vendors whose vehicles were boldly lettered "Snackmobile." There were long lines in front of small, sturdy structures with maximum occupancy of one person that the project had thoughtfully provided. Children scampered among the vehicles, sleeping bags, blankets, and portable picnic tables like a pack of puppies, almost never chided by the adults -- except when they came too close to the highway, or to the fence nearest Telescope 61, where a group of shaven-headed, kow-towed, saffron-robed young adults were solemnly intoning the sacred syllable, "Om." ~~The Rolling Stones, the Grateful Dead, Woodstock, and indeed most of the~~ countercultural revolution, musical and non-musical, of the 1960s ~~had passed much of the American Southwest without leaving a mark, and~~ this polyglot vigil made some native New Mexicans uneasy -- an unseemly importation from an alien culture. In a state with almost no blacks, there was a smattering of black women of devotional temperament. There were posters with imagined representations of extraterrestrial beings, some made popular by comic books or motion pictures. A man with golden earrings was shaving, using the side mirror of someone's whose chest was tattooed with a representation ~~pictorial~~ reminiscence of the U.S.S. pickup truck Norfolk was performing a tardy ablution, and a black-haired woman in a serape raised a cup of coffee in salute as the ~~automobile~~ convoy sped by.

As they approached the new main gate, near Telescope 101, Ellie could see a young man on a jerrybuilt platform importuning a crowd of some hundreds. He was wearing a T-shirt that depicted Earth being

struck by a bolt of celestial lightning. Several others in the crowd, she noticed, were wearing the same enigmatic adornment. At Ellie's urging, once through the gate, they pulled off the side of the road, rolled down the window, and listened. The speaker was turned away from them and they could see the faces in the crowd. These people are deeply moved, Ellie thought to herself. The speaker was in mid-oration:

"And others say that there's been a pact with the Devil, that the scientists have sold their souls. There are ~~rubies~~ ^{precious stones} in every one of these telescopes." He waved his hand towards 101. "Even the scientists admit that." *"It's the Devil's part of the bargain."*

"Religious hooliganism," Lunacharsky muttered darkly, his eyes yearning for the open road before them.

"No, no. Let's stay," she returned. A half-smile of wonderment was playing on her lips.

"There are some others ~~among you~~ who believe this Message comes from ~~other~~ beings in space, ~~other~~ entities, hostile creatures, ^{aliens}, intent upon our destruction, the enemies of Man." He fairly shouted this last phrase, and then paused for effect. "But all of you are wearied and disgusted by the corruption, the decay in this society, a decay brought on by unthinking, unbridled, ungodly technology. ~~It's been all downhill since the Sea of Faith was at the full.~~

"I don't know which of you is right. I can't tell you what the Message means. I have my suspicions. But I'm not going to say now who the Message is from. We'll know soon enough. But I do know

this: The scientists and the politicians and the bureaucrats are holding out on us. They haven't told us all they know. They're deceiving us, like they always ~~have~~^{do.} For too long, Oh God, we have swallowed the lies they feed us, the corruption they bring."

To Ellie's astonishment a deep rumbling chorus of assent rose from the crowd. He had tapped some well of resentment she had only vaguely apprehended. There was a stamping of feet, cries and whistles.

"These scientists don't believe we're the children of God. Are we going to let a bunch of long-haired scientists decide the fate of the world?"
They think we're the children of apes. Do you want people like that to decide the fate of the world? ✓

The crowd responded with a thunderous "No!" ~~while~~^{as}, turning to Ellie, Lunacharsky pointed, expressionless, to his bald head.

"Do you want a pack of unbelievers to do the talking to God?"

"No!" they roared again.

"They are bargaining away our future with ~~some~~ monsters from an alien world. My brothers and sisters, there is an evil in this place."

Ellie had thought the orator unaware of their presence. But now he half turned and pointed, through the cyclone fence, directly at the idling convoy. ⁹"They don't speak for us. They don't represent us. They have no right to parlay in our name!"

Some of the crowd nearest the fence began jostling and rhythmically pushing. Both ~~X~~^{Valerian} and the driver became alarmed. The engines had been left running, and in a moment they accelerated from the gate towards the Argus Administration Building, still many miles

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distant across the scrub desert. As they pulled away, over the sound of squealing tires and the murmur of the crowd, Ellie could hear the orator, his voice ringing clearly. ⁹"The evil in this place will be stopped. I swear it."

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She had planned to meet Vaygay's plane in Albuquerque and drive him back to the Argus facility in the Thunderbird. The rest of the Soviet delegation would have traveled in the observatory cars. She would have enjoyed speeding to the airport in the cool dawn air, perhaps again past an honor guard of rampant coney. And she had been anticipating a long substantive and private talk with Vaygay on the return. But the new security people from the General Services Administration had vetoed the idea. Media attention and the President's sober announcement at the end of his press conference two weeks before had brought enormous crowds to the isolated desert site. There was a potential for violence, they had told her. She must in future travel only in government cars and then only with discreetly armed escorts. Their little convoy was wending its way towards Albuquerque at a pace so sober and responsible that she found her right foot depressing an imaginary accelerator on the rubber mat before her.

It would be good to spend some time with Vaygay again. She had last seen him in Moscow three years before, during one of those intermittent periods in which he was forbidden to visit the West. Permission for foreign travel had waxed and waned through the decades, in response to changing policy fashions and Vaygay's own behavior.

Permission would be denied him after some mild political provocation about which he seemed unable to restrain himself, and then granted again when no one of comparable ability could be found to flesh out some scientific delegation. He received invitations from all over the world for lectures, seminars, colloquia, conferences, joint study groups and international commissions. As a Nobel Laureate in physics, and as a full member of the Soviet Academy of Sciences, he could afford to be a little more independent than most. He often seemed poised precariously at the outer limits of the patience and restraint of the governmental orthodoxy.

His full name was Vasily Gregorovich Lunacharsky, known throughout the global community of physicists as Vaygay after the initials of his first name and patronymic. His fluctuating and ambiguous relations with the Soviet regime puzzled her and others in the West. He was a distant relative of Anatoly Vasilyevich Lunacharsky, an old Bolshevik colleague of Gorky, Lenin and Trotsky, People's Commissar for Education in 1917, and Soviet Ambassador to Spain during the Civil War [1933, CHECK]. His mother had been Jewish. He had, it was said, worked on Soviet nuclear weapons, although surely he had been too young to have played much of a role even in the fashioning of the first Soviet thermonuclear explosion. Once, during a vigorous discussion on the relative merits of the two political systems, Ellie had boasted that she had been free to march in front of the White House protesting American involvement in the Viet Nam War. Vaygay replied that in the same period he had been

equally free to march in front of the Kremlin protesting American involvement in the Viet Nam War.

His institute was well-staffed and well-equipped, and his scientific productivity was prodigious, indicating at most infrequent distractions by the Committee for State Security. Despite the ebb and flow of permission for foreign travel, he had been a frequent attendee at major international conferences including the "Rochester" conferences on high-energy physics, the "Texas" meetings on relativistic astrophysics, and the informal but occasionally influential "Pugwash" scientific meetings on ways of reducing international tension.

In the 1960s, she had been told, Vaygay visited the University of California at Berkeley, and was delighted with the proliferation of irreverent, scatological, and politically outrageous slogans imprinted on inexpensive buttons. You could, she recalled with faint nostalgia, size up someone's most pressing social concerns at a glance. Buttons were also popular and fiercely traded in the Soviet Union, but usually they celebrated the "Dynamo" soccer team, or one of the successful spacecraft of the Luna series, which had been the first spacecraft to land on the Moon. The Berkeley buttons were different. He had bought dozens of them, but delighted in wearing one in particular. It read, "Pray for Sex." He even displayed it at a few scientific meetings. When asked about its appeal, he would say, "In your country, it is offensive in only one way. In my country, it is offensive in two independent ways." If pressed further he would only comment that his

famous Bolshevik relative had written a book on the place of religion in a socialist society. Since then, his English had improved enormously (much more than Ellie's Russian), and his propensity for wearing offensive lapel buttons had diminished.

He had never been inclined, say, to photograph the garbage scows burdened with malodorous refuse and squawking seagulls, lumbering in front of the Statue of Liberty, as another Soviet scientist had when for fun she had taken him on the Staten Island Ferry during a break in a meeting in New York City. Nor had he, as had some of his colleagues, ardently photographed the tumbledown shanties and corrugated metal huts of the Puerto Rican poor, during a bus excursion from a luxurious beachfront hotel to the Arecibo Observatory. Who did they submit these pictures to, Ellie wondered. She conjured up some vast KGB library on the infelicities, injustices and contradictions of capitalist society. Did it warm them, when disconsolate with some of the failures of Soviet society, to browse through the fading snapshots of their imperfect American cousins?

There were many brilliant scientists in the Soviet Union who, for unknown offenses, had not been permitted out of Eastern Europe in decades. Konstantinov, for example, had never been to the West until the middle 1960s. When, at an international meeting in Warsaw, over a table encumbered with dozens of depleted Azerbaijani brandy snifters, their missions completed, Konstantinov was asked why, he replied, "Because the bastards know, they let me out, I never come back." Nevertheless, they had let him out, sure enough, during the thaw in

scientific relations between the two countries in the late '60s and early '70s, and he had come back every time. But now they let him out no more, and he was reduced to sending his Western colleagues New Year's cards, in which he portrayed himself forlornly crosslegged, head bowed, seated on a sphere below which was the Schwarzschild equation for the radius of a black hole. He was in a deep potential well, he would tell visitors to Moscow in the metaphors of physics. They would never let him out again.

In the middle of Watergate, Vaygay never asked his American colleagues how it was possible for a Federal District Judge to defy a President, although his Soviet colleagues, almost to a man, shook their heads and tut-tutted in amazement at it. "Even the President must obey the law," Ellie would explain. Most of them would look at her in some bafflement, trying to understand so unpredictable and disorderly a society. Earlier, Vaygay would ask about the meaning of signs reading "Impeach Earl Warren," and would inquire about how many blacks and women were members of the National Academy of Sciences. But she had the sense that he was genuinely interested, that he was not trying to make a propaganda point, that he was attempting to understand this alien culture that had grown up half way around the world. He would volunteer that very few Soviet citizens of Moslem or Asiatic backgrounds were members of the Soviet Academy of Sciences, and almost no women. These injustices were, to first order, symmetrical. In response to questions, he would say that the official Soviet position had been that the Hungarian revolution of 1956 was

organized by cryptofascists, and that the Czechoslovakian spring of 1968 was made by an unrepresentative anti-socialist group in the leadership. But, he would add, if what he had been told was mistaken, if these were genuine popular uprisings, then his country had been wrong in suppressing them. On Afghanistan, he did not even bother quoting the official justifications. Once, in his office at the Institute, he had insisted on showing Ellie his personal radio on which were frequencies labeled London and Paris and Washington, neatly spelled out in Cyrillic letters. He was free, he told her, to listen to propaganda of all nations.

There had been a time when many of his fellows had surrendered to national rhetoric about the yellow peril. "Imagine the entire frontier between China and the Soviet Union occupied by Chinese soldiers, shoulder to shoulder, an invading army," they had asked her around the samovar in the Director's office at the Institute. "How long would it be, with the present Chinese birthrate, before they all passed over the border?" And the answer would be pronounced, in an unlikely mix of dark foreboding and arithmetic delight, "Never." William Randolph Hearst would have felt at home. But not Lunacharsky. Stationing so many Chinese soldiers on the frontier would automatically lower the birthrate precipitously, he argued. Their calculations were therefore in error. He had phrased it as though the misuse of mathematical models was the subject of his disapproval, but few mistook his meaning. In the worst of the Sino-Soviet tensions, he had never, so far as Ellie knew, allowed himself to be swept up in the paranoia and racism of some of his fellows.

Ellie loved the samovars and could understand the Russian affection for them. Their Lunakhod, the successful unmanned lunar rover that looked like a bathtub on wire wheels, seemed to her to have a little samovar technology somewhere in its ancestry. Vaygay had once taken her to see a model of Lunakhod in a sprawling exhibition park outside of Moscow on a splendid June morning. There, next to a building displaying the wares and charms of the Tadzhik Autonomous Republic, was a great hall filled to the rafters with full-scale models of Soviet civilian space vehicles. Sputnik 1, the first orbiting spacecraft in human history; Luna ____, the first spacecraft to photograph the far side of the Moon; Venera ____, the first spacecraft to land on the surface of Venus; and _____, the first manned spacecraft that carried Hero of the Soviet Union, Cosmonaut Yuri __ Gagarin on a single orbit of the Earth. Outside, children were using the fins of the Vostok launch booster as slides, their pretty blond curls and red Komsomol neckerchiefs flaring as, to much hilarity, they descended to land. "Zemlya," it was called in Russian. The large Soviet island in the Arctic Sea was called Novaya Zemlya, New Land. It was there that, in the 1950s, they had detonated a 58 megaton thermonuclear weapon, the largest single explosion ever devised by the human species. But on that spring day, with the vendors hawking the ice cream in which Moscovites take so much pride, with families on outings and a toothless old man smiling at Ellie and Lunacharsky as if they were lovers, the old land had seemed nice enough.

In her infrequent visits to Moscow or Leningrad, Vaygay would often arrange the evenings. A group of six or eight of them would go to the Bolshoi or the Kirov ballet. Lunacharsky somehow would arrange the tickets. She would thank her hosts for the evening, and they -- explaining that it was only with foreign visitors that they themselves were able to attend such performances -- would thank her. Vaygay would only smile. He never brought his wife, and Ellie had never met her. She was, he said, a physician who was devoted to her patients. There was only one other remark about his immediate family that she could remember him making. She had asked him what his greatest regret was, because his parents, when young, had not, as they once contemplated, emigrated to America. (This was early in their relationship, and she had not phrased the question with much delicacy.) "Just one," he had said thoughtfully, in his gravelly voice. "My daughter married a Bulgarian."

Once he arranged a dinner at a Caucasian restaurant in Moscow. A professional toastmaster named Khaladze had been engaged for the evening. The man was brilliant in the subtlety and generosity of his toasts -- although her Russian was bad enough that she was obliged to ask that most of the toasts be translated. An early and comparatively mediocre one had ended "To peace on all planets," and Vaygay explained to her that the word "mir" meant both peace and a self-governing community of peasant households that went back to ancient times. They had talked about whether the world had been more peaceful when its largest political units had been no larger than

villages. "Every village is a planet," Lunacharsky had said. "And every planet is a village," she had returned.

Such gatherings would be a little raucous. A great deal of brandy and vodka would be drunk, but no one ever seemed seriously inebriated. They would come out of the restaurant at one or two in the morning and try, often vainly, to find a taxicab. Several times he had escorted her on foot a distance of five or six kilometers from the restaurant back to her hotel. He was attentive, a little avuncular, tolerant in his political judgments, fierce in his scientific pronouncements, and never, although his sexual escapades were legendary among his colleagues, did he ever permit himself so much as a goodnight kiss with Ellie. This had always distressed her a little, although his affection for her was plain.

There were many women in the Soviet scientific community, proportionately more so than in the United States. But they tended to occupy menial to middle level positions, and male Soviet scientists, like their American counterparts, were puzzled about a pretty woman with evident scientific competence who expressed her views vigorously. Some would, almost unconsciously, interrupt her or pretend not to hear her. And Lunacharsky would always, as DeVries would in a comparable situation, lean over and ask in a louder voice than usual, "What did you say, Dr. Arroway? I didn't quite manage to hear." The others would then fall silent and she would continue about doped gallium arsenide detectors, or the ethanol content of the galactic cloud W-3. The quantity of 200 proof alcohol in this single

interstellar cloud was more than enough to maintain the present population of the Earth, if every adult were a dedicated alcoholic, for the age of the solar system. The Georgian toastmaster had appreciated the remark. In their subsequent toasts, they had speculated on whether very different life forms would be intoxicated by ethanol, whether public drunkenness was a galaxy-wide problem, and whether a toastmaster on any other world could be as skillful as our Trofim Sergeivich Khaladze.

* * * *

They arrived at Albuquerque airport to discover that, miraculously, the commercial flight from New York with the Soviet delegation aboard had landed a half hour early. Ellie found Vaygay at an airport souvenir shop negotiating the price of some trinket. He must have seen her out of the corner of his eye. Without turning to face her he lifted a finger: "One second, Arroway. \$19.95?" he continued to the elaborately disinterested salesclerk. "I saw the

identical set in New York yesterday for \$17.50." She edged closer and observed Vaygay spreading a set of holographic playing cards, displaying nudes of both sexes in poses, now considered merely indecorous, that would have scandalized the previous generation. The clerk was making halfhearted attempts to gather the cards up as Lunacharsky made vigorous and successful efforts to cover the counter with the cards. Vaygay was winning. "I'm sorry, sir, I don't set prices. I only work here," complained the clerk.

"You see the deficiencies of a planned economy," he turned to Ellie while proffering a 20 dollar bill to the clerk. "In a true free enterprise system, I could probably purchase this for \$15.00. Don't look at me so quizzically, Ellie. This is not for me. Holograms are only a small step closer to reality. With the jokers there are 54 cards here. Every one of them will make a nice gift for some worker at my Institute." She smiled and took his arm.

"It's good to see you again, Vaygay."

"An infrequent delight, my dear."

* * * *

On the drive to Soccoro, by mutual but unspoken agreement, they talked mainly pleasantries. X and the driver, one of the new security people, were in the front seats. X, not a voluble man even in ordinary circumstances, was content to lean back and listen to their conversation which touched only tangentially on the issue the Soviets had come to discuss: the third level of the palimpsest, the elaborate, complex, and still undecoded message they were receiving. The U.S. government had, more or less reluctantly, concluded that Soviet participation was essential. This was true especially because the signal from Vega was so intense that even modest radiotelescopes could detect it, and years before the Soviets had prudently deployed a large number of small dishes across the entire Eurasian land mass, stretching 25,000 kilometers [CHECK] around the surface of the Earth. In addition, Soviet ocean-going satellite tracking vessels were patrolling both the Atlantic and the Pacific. Some of the Soviet data was redundant, because observatories in Japan, China, India and Iraq were recording the signals as well. Indeed, every substantial radiotelescope in the world that had Vega in its sky was listening. Astronomers in Britain, France, The Netherlands, Sweden [CHECK.], Germany, and Czechoslovakia, in Canada and Venezuela, in Australia and South Africa [CHECK. VERY IMPORTANT.] were recording small pieces of the message, following Vega from when it rose to when it set. In some observatories the detection equipment was not sensitive enough even to make out the individual pulses. They listened anyway to the blurred

message. All these nations had a piece of the jigsaw puzzle because, as Ellie had reminded Secretary Kitz, the Earth turns. Every nation tried to make some sense out of the impulses. But it was very difficult. No one could tell even if it was written in symbols or in pictures.

It was perfectly conceivable that they would not decrypt the message until it cycled back to page 1 and began again with the introduction, the primer, the decoding key. Maybe it was a very long message, Ellie thought as Vaygay compared taiga with scrub desert. Maybe it wouldn't cycle back for a hundred years. Or maybe there was no primer. Maybe the Message (the word was now beginning to be capitalized) was an intelligence test, and those too stupid to decrypt it were not entitled to its contents. It suddenly struck her what a humiliation she would feel for the human species if, in the end, they failed to understand the Message. The moment the Americans and the Soviets decided to collaborate, and the Memorandum of Agreement solemnly signed, every other nation with a radiotelescope agreed to cooperate. There was a kind of World Message Consortium, and people were actually talking in those terms. They needed one another's data, and they needed one another's brain power if the Message was to be decrypted.

The newspapers were full of little else. The pitiful little that was known -- the prime numbers, the Olympic broadcast, the existence of a complex message -- were endlessly reviewed. There were few people on the planet who had not heard about the Message from Vega.

Religious sects, established and marginal, some newly invented for the purpose, were dissecting the theological implications of the Message. Some thought it was from God, and some from the Devil. Astonishingly, some were even unsure. There was a nasty resurgence of interest in Hitler and the Nazi regime, and Vaygay mentioned to her that he had found a total of eight swastikas in the advertisements in that Sunday's New York Times Book Review. There were those who considered the listening an abomination, and urged the observatories to stop; there were those who considered it a Sign of the Advent, and urged the construction of still larger radiotelescopes, some of them in space. There were those who cautioned against paying attention to the Soviet data, on grounds that it might be falsified or fraudulent (although in the longitudes of overlap it agreed well with the Iraqi, Indian, Chinese and Japanese data). And there were those who sensed a change in the world political climate and contended that the very existence of the Message, even if it were never decoded, was exercising a benign influence on the contending nation states. Since (a) the transmitting civilization was clearly more advanced than ours; and (b) it clearly, at least as of 26 years ago, had not destroyed itself, it followed, some argued, that technological civilizations did not inevitably self-destruct. In a world gingerly experimenting with major divestitures of nuclear weapons and their delivery systems, the Message was taken by many as a token of hope.

Those with predispositions favoring such a cheerful prognosis found themselves edging uncomfortably towards ground that had been occupied for a decade by the chiliastic movement. Some chiliasts held that the imminent arrival of the third millenium would be accompanied by the return of Jesus or Buddha or The Prophet, who would establish on Earth a benevolent theocracy, severe in its judgment of mortals. Perhaps this would prelude the mass celestial ascent of the Elect. But there were other chiliasts, and there were far more of these, who held that the physical destruction of the world was the indispensable prerequisite for the Advent; this had been unerringly foretold in various otherwise mutually contradictory ancient prophetic works. The Domsday Chiliasts were uneasy with the whiff of world community in the air, and troubled by the steady annual decline in the global stockpiles of strategic weapons. The most readily available means for fulfilling the central tenet of their faith were being disassembled day by day. Other candidate catastrophes -- overpopulation, industrial pollution, earthquakes, volcanic explosions, greenhouse warming, ice ages, or cometary impact with the Earth -- were too slow, too improbable, or insufficiently apocalyptic for the purpose. Some of their leaders had assured cheering crowds that, except for accidents, life insurance was a token of wayward faith; that, except for the very elderly, to purchase a gravesite or make funeral arrangements in other than urgent necessity was deeply impious. All who believed would be raised bodily to Heaven, would stand before the throne of God, in only a few years.

Ellie knew that Lunacharsky's famous relative had been that rarest of beings, a Bolshevik revolutionary with a scholarly interest in the world's religions. But the attention Vaygay directed to the growing worldwide theological ferment was apparently muted. "The main question," he said, "is whether the Vegans have properly denounced Leon Trotsky."

* * * *

As they approached the Argus site, the roadside became dense with parked automobiles and campers, and great crowds of people. At night, the once tranquil plains of San Augustin were illuminated by hundreds of campfires. The people along the highway were by no means all well-to-do. She noticed two young couples. The men were in T-shirts and worn jeans, belted around their hips, swaggering a little as they had been taught by their seniors upon entering high school, talking animatedly. One of them pushed a ragged stroller, in which sat a carefree boy about two years old. The women followed behind

their husbands, one of them holding the hand of a toddler new to the human art of walking, and the other cantilevered forward with what in another month or two would be a further life born on this obscure planet. There were mystics from sequestered communities outside Taos, who used psilocybin as a sacrament, and nuns from a convent near Albuquerque who used ethanol for the same purpose. There were leather-skinned, crinkly-eyed men who had spent their whole lives under the open sky, and bookish, sallow-faced students from the University of Arizona in Tucson. There were silk cravats and burnished silver string ties sold by Navajo entrepreneurs at exorbitant prices, a small reversal of the historical commercial relations between whites and Native Americans. Chewing tobacco and bubble gum were being vigorously employed by enlisted men on leave from Davis-Monthan [CHECK] Air Force Base. An elegantly attired, white-haired man in a \$600 suit with a color-coordinated Stetson was, just possibly, a rancher. There were people who lived in barracks and skyscrapers, in adobe hovels, in dormitories, in trailer parks. Some came because they had nothing better to do, some because they wanted to tell their grandchildren that they had been there. Some arrived hoping for failure, others confident of witnessing a miracle. Sounds of quiet devotion, raucous hilarity, mystic ecstasy, and subdued expectation rose from the crowd into the brilliant afternoon sunlight. A few heads glanced incuriously at their automobiles, marked "U.S. Government Interagency Motor Pool."

Some people were lunching on the tailgates of hatchbacks, others sampling the wares of itinerant vendors whose vehicles were boldly lettered "Snackmobile." There were long lines in front of small, sturdy structures with maximum occupancy of one person that the project had thoughtfully provided. Children scampered among the vehicles, sleeping bags, blankets, and portable picnic tables like a pack of puppies, almost never chided by the adults -- except when they came too close to the highway, or to the fence nearest Telescope 61, where a group of shaven-headed, kow-towed, saffron-robed young adults were solemnly intoning the sacred syllable, "Om." The Rolling Stones, the Grateful Dead, Woodstock, and indeed most of the countercultural revolution, musical and non-musical, of the 1960s had passed much of the American Southwest without leaving a mark, and this polyglot vigil made some native New Mexicans uneasy -- an unseemly importation from an alien culture. In a state with almost no blacks, there was a smattering of black women of devotional temperament. There were posters with imagined representations of extraterrestrial beings, some made popular by comic books or motion pictures. A man whose chest was tattooed with a pictorial reminiscence of the U.S.S. Norfolk was performing a tardy ablution, and a black-haired woman in a serape raised a cup of coffee in salute as the automobile convoy sped by.

As they approached the new main gate, near Telescope 101, Ellie could see a young man on a jerrybuilt platform importuning a crowd of

some hundreds. He was wearing a T-shirt that depicted Earth being struck by a bolt of celestial lightning. Several others in the crowd, she noticed, were wearing the same enigmatic adornment. At Ellie's urging, once through the gate, they pulled off the side of the road, rolled down the window, and listened. The speaker was turned away from them and they could see the faces in the crowd. These people are deeply moved, Ellie thought to herself. The speaker was in mid-oration:

"And others say that there's been a pact with the Devil, that the scientists have sold their souls. There are rubies in every one of these telescopes." He waved his hand towards 101. "Even the scientists admit that."

"Religious hooliganism," Lunacharsky muttered darkly, his eyes yearning for the open road before them.

"No, no. Let's stay," she returned. A half-smile of wonderment was playing on her lips.

"There are some others among you who believe this Message comes from other beings in space, other entities, hostile creatures, intent upon our destruction, the enemies of Man." He fairly shouted this last phrase, and then paused for effect. "But all of you are wearied and disgusted by the corruption, the decay in this society, a decay brought on by unthinking, unbridled, ungodly technology. It's been all downhill since the Sea of Faith was at the full.

"I don't know which of you is right. I can't tell you what the Message means. I have my suspicions. But I'm not going to say now who the Message is from. We'll know soon enough. But I do know this. The scientists and the politicians and the bureaucrats are holding out on us. They haven't told us all they know. They're deceiving us, like they always have. For too long, Oh God, we have swallowed the lies they feed us, the corruption they bring."

To Ellie's astonishment a deep rumbling chorus of assent rose from the crowd. He had tapped some well of resentment she had only vaguely apprehended. There was a stamping of feet, cries and whistles.

"Are we going to let a bunch of long-haired scientists decide the fate of the world?"

The crowd responded with a thunderous "No!" while, turning to Ellie, Lunacharsky pointed, expressionless, to his bald head.

"Do you want a pack of unbelievers to do the talking to God?"

"No!" they roared again.

"They are bargaining away our future with some monsters from an alien world. My brothers and sisters, there is an evil in this place."

Ellie had thought the orator unaware of their presence. But now he half turned and pointed, through the cyclone fence, directly at the idling convoy. "They don't speak for us. They don't represent us. They have no right to parlay in our name!"

Some of the crowd nearest the fence began jostling and rhythmically pushing. Both X and the driver became alarmed. The engines had been left running, and in a moment they accelerated from the gate towards the Argus Administration Building, still many miles distant across the scrub desert. As they pulled away, over the sound of squealing tires and the murmur of the crowd, Ellie could hear the orator, his voice ringing clearly, "The evil in this place will be stopped. I swear it."

Second draft

Chap. 8 + Sept. 27, 1984 version

Second DRAFT

CS

Contact: CHAPTER 8

RANDOM ACCESS [?]

Page 8/1

~~20 July, 1984~~

Insert pp. 8/18 - 8/17

in passing

It was mentioned in his profile in Time-Newsweek; it was no secret. Palmer Joss had been a carnival roustabout. To help make his fortune

he arranged for a map of the Earth, in cylindrical projection, to be painstakingly tattooed on his torso. He would exhibit himself in county fairs and sideshows from Oklahoma to Mississippi, one of the stragglers and remnants of a more vigorous age of rural itinerant entertainment. In the expanse of blue ocean were the four gods of the winds, their cheeks puffing forth prevailing westerlies and nor'easters. By flexing his pectorals, he could make Boreas swell along with the mid-Atlantic. Then, he would declaim to the astonished onlookers from Book 6 of Ovid's Metamorphoses:

"Monarch of Violence, rolling on clouds,
I toss wide waters, and I fell huge trees . . .
Possessed of daemon-rage, I penetrate,
Sheer to the utmost caverns of old Earth;
And straining, up from those unfathomed deeps,
Scatter the terror-stricken shades of Hell;
And hurl death-dealing earthquakes throughout the world!"

Fire and brimstone from Ancient Rome. ~~On~~ ^V With some help from his hands, he would demonstrate continental drift, pressing West Africa against South America, so they joined almost perfectly at the longitude of his navel. They billed him as "Geos, the Earth Man."

Joss was a great reader, and being unencumbered by a formal education past grade school, he had not been told that science and classics were unseemly fare for ~~the untutored~~ ^{ordinary people. Aided by his}. With casual, rumpled good looks, he would ingratiate himself with librarians in the towns along the ~~the~~ ^{Q.C.} carnival's trek, and ask what serious books he should read. He wanted, he told them, to improve himself. Dutifully, he read about winning friends and investing in real estate and ~~dominating~~ ^{intimidating} your acquaintances without their ~~knowing~~ ^{noticing}, but felt these books somehow shallow, hollow, empty. ^[same phrase earlier chapter?] In ancient literature and in modern science, ~~By~~ ^{Q.C.} contrast, he thought he detected quality. When there were layovers, he would haunt the local town or county library. He taught himself some geography and history. They were job-related, he told Elvira, the Elephant Girl, who ~~sometimes~~ questioned him closely on his absences. She suspected him of compulsive dalliances -- a librarian in every port, she once said -- ^{she had to admit} but his professional patter was improving: the contents were ~~a bit~~ ^{too} highbrow, but the delivery was down home. Unaccountably, Joss' little stall began to make money for the carnival.

~~He~~ ^{Q.C.} was one day demonstrating, ~~his back to the audience,~~ the collision of India with Asia and the resulting crinkling up of the Himalayas, when, out of a gray but rainless sky, a lightning bolt flashed and struck him dead. There had been twisters in Southeastern Oklahoma, and the weather was unusual throughout the South. He had a perfectly lucid sense of leaving his body -- pitifully crumbled on the sawdust-covered planking, being regarded with caution and ^{something akin to} awe by

the small crowd -- and rising, rising as if through a long, dark tunnel, slowly approaching a brilliant light. And in the radiance he gradually discerned a figure of heroic, indeed of God-like, proportions.

When he awoke he found a part of himself disappointed to be alive. He was lying on a cot in a comfortable but not elaborately furnished bedroom. Leaning over him was the Reverend Billy Jo Rankin, not the present incumbent of that name, but his father, a venerable surrogate preacher of the third quarter of the 20th Century. In the background, Joss thought he could see a dozen hooded figures singing the Kyrie Eleison, the Greek Orthodox hymn for the dead, [CHECK!] But he couldn't be sure. ✓

"Am I gonna live or die?" the young man asked.

"My boy, you're gonna do both."

Smart 9 He really had been dead, they told him afterwards. A doctor had pronounced him dead. But they prayed over him, they sang hymns, and they even ~~intermittently attempted~~ ^{tried} to revive him by body massage (mainly in the vicinity of the Balkans). They had returned him to life. He had been truly and literally reborn. Since this corresponded so well to his own perception of the ~~circumstance~~ ^{experience}, he accepted the explanation, and gladly. While he almost never talked about it, he became convinced of the ~~profundity and~~ significance of the event. He had not been struck dead for nothing. He had not been brought back for no reason.

Insult, p. 8/3

17 December 1984

CONTACT

It ~~He was soon overcome~~ *poignant*
~~When he awoke, it was with a sense of joy and discovery at~~
the delights of the world, ^{*The feeling*} ~~that~~ never fully left him thereafter.
But in a way that was difficult for him to articulate with
precision, ~~this delight~~ ^{*it*} was in conflict with the beatific
vision that he had ~~miraculously~~ beheld, and the infinite
joy that vision portended. He could sense the two feelings
^{*in conflict*} ~~contending~~ within his breast, and ^{*while he*} ~~for a moment~~ was puzzled
at why they should not ^{*negotiate*} a treaty of mutual support, or at
least an end to hostilities. ~~And, I~~ In various circumstances,
sometimes in mid-sentence, he would become aware of one
^{*or the other of these*} ~~of the~~ feelings making some claim on speech or action.

Under his patron's tutelage, he began to study Scripture. Once seriously considered, the idea of the Resurrection moved him deeply, as did the doctrine of Salvation. He assisted the Reverend Mr. Rankin at first in small ways, ~~and eventually filling~~ He began to fill in for him in the more onerous or more distant preaching assignments. Soon he found a

-- when the younger Billy Jo Rankin left for Odessa, Texas in answer to a call from God.

preaching style that was his own, not so much exhortatory as explanatory. In simple language and homely metaphors, he would explain baptism and transubstantiation, [CHECK], the connection of Christian revelation with the myths of classical Greece and Rome, the idea of God's plan for the world, and the conformity of science and religion, when both were properly understood. This was not the conventional preaching, and it was too ecumenical for many tastes. But it also proved unaccountably popular.

"You've been reborn, Joss," the elder Rankin told him. "So you ought to change your name. Except Palmer Joss is such a fine name for a preacher, you'd be a fool not to keep it."

Like doctors and lawyers, the vendors of religion rarely criticize one another's wares, Joss observed. But one night, incognito, he attended services at the new Church of God, Crusader, to hear the younger Billy Jo Rankin, ~~preach~~ triumphantly returned from Odessa, Billy Jo enunciated a stark doctrine of Reward, Retribution and the Rapture. But tonight was a healing night. The curative instrument, the ~~multitudes were~~ congregation was told, was the holiest of relics -- holier than a piece of the True Cross, holier even than the thigh bone of St. Teresa of Avila that Generalissimo Francisco Franco kept in his office to intimidate the

pious. What Billy Jo Rankin brandished was the actual amniotic fluid that protected and surrounded our Lord. The liquid had been carefully preserved in an ancient earthenware vessel that once belonged, so it was said, to Saint Ann. The tiniest drop of it would cure what ails you, through a special act of Divine Grace. This holiest of holy waters was with us tonight.

Joss was appalled, not so much that Rankin would attempt so transparent a scam, but that any of the parishioners were so credulous as to accept it. In his previous life, he had witnessed many, and *even* acquiesced in some, attempts to bamboozle the public. But that was entertainment. This was different. This was religion. Religion was too important to gloss the truth, much less to manufacture miracles. ~~out of whole cloth.~~ He took to denouncing this imposture from the pulpit. *¶* As his fervor grew, he railed against other deviant forms of Christian fundamentalism, including those aspirant herpetologists who tested their faith by fondling snakes in accord with the biblical injunction that *the* pure of heart shall not fear the venom of serpents. *¶* In one widely quoted sermon he paraphrased Voltaire. He never thought, he said, that he would find men of the cloth so venal and avaricious as almost to justify the blasphemy that the first priest was the first rogue who met the first fool. These religions were damaging religion. He shook his finger gracefully in the air. *¶* Joss argued that in every religion there was a doctrinal line beyond which was an insult to the intelligence of its practitioners. Reasonable people might disagree as to where that line should be

drawn, but religions trespassed beyond it at their peril. People were not fools, he said. ^{The Day} ~~Shortly~~ before his death, the elder Rankin sent word to Joss that he never wanted to lay eyes on him again.

At the same time, ^{Joss} ~~he~~ began to preach, science ^{didn't} ~~did not~~ have all the answers either. He found inconsistencies in the theory of evolution. The embarrassing findings, the facts that don't fit, the scientists just sweep under the rug, he said. They don't really know that the Earth is 4.6 billion years old, any more than Archbishop Ussher knew that it was 6,000 years old. Nobody has seen evolution happen, nobody has been counting seconds since the Creation ("Two-hundred-quadrillion-Mississippi . . . " he once imagined the patient timekeeper intoning, counting up the seconds ^{from} ~~since~~ the origin of the world). ⁹⁷ And Einstein's theory of relativity was also unproved. You couldn't travel faster than light no matter what, Einstein had said. How could he know? How close to the speed of light had he gone? Relativity was only a way of understanding the world. Einstein couldn't restrict what mankind could do in the far future. And Einstein sure couldn't set limits on what God could do. Couldn't God travel faster than light if He wanted to? Couldn't God make us travel faster than light if He wanted to? There were excesses in science and there were excesses in religion. A reasonable man wouldn't be stampeded by either one. There were many interpretations of Scripture, and many interpretations of the natural world. Both were created by God. Both must be mutually consistent. Wherever a discrepancy seems to exist, either a scientist or a theologian -- maybe both -- haven't been doing their job.

Palmer Joss combined his even-handed criticism of science and religion with a fervent plea for moral rectitude and a respect for the intelligence of his flock. In slow stages he acquired a national reputation. In debates on the teaching of "scientific creationism" in the schools, on the ethical status of abortion and frozen embryos, on the admissibility of genetic engineering, he attempted ~~in his way~~ to steer a middle course, to reconcile ^{caricatures of} ~~conflicting opinions attributed to~~ science and religion. Both contending camps were outraged at his interventions, and his popularity grew. He became a confidant of Presidents. His sermons were excerpted on the Op Ed pages of major secular newspapers. But he resisted ~~the~~ many invitations and some blandishments to found an electronic church. He continued to live simply, rarely -- except for Presidential invitations and ecumenical congresses -- leaving the rural South. Beyond a conventional patriotism, he made it a rule not to meddle in politics. In a field filled with competing entries, many of dubious probity, he became, in erudition and moral authority, the preeminent Christian fundamentalist preacher of his day.

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20 July, 1984

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Start from here to p. 814 to p. 811

She ignored random access and idly advanced, through the television channels Sequentially. There was a spirited basketball game between the Johnson City Wildcats and the Union-Endicott Tigers. *serious, dedicated, earnest.* The young men and women were ~~endearing in their dedication and seriousness~~. On the adjacent channel was an exhortation by Imam Mahdi -- speaking in Parsi -- on proper versus improper observances of Ramadan. Next was one of the locked channels, this one apparently devoted to ~~legal but~~ universally abhorrent sexual practices. Beyond was one of the premier computer ~~access~~ channels, dedicated to fantasy role-playing games. Accessed to your home computer, it offered a single entry into a new adventure, today's apparently called "Galactic Gilgamesh," in hopes that you would find it sufficiently attractive to order the corresponding floppy disc on one of the vending channels. Proper electronic precautions were taken so you could not record the program during your single play. *know* As she cycled through the channels, past the Soviet Embassy's Russian language news and comment program, an Oriental cooking series devoted this week to the hibachi, an extended advertisement for the first generation of general purpose *household* ~~home~~ robots by *Haddon* ~~Logan~~ Cybernetics, several children's and news frequencies, the mathematics channel displaying the dazzling computer graphics of the new Cornell analytic geometry course, the local apartments and real estate channel, and a tight cluster of execrable daytime serial stations, she would come upon religious channels where, with sustained and general excitement, the Message was being discussed.

17 July, 1984

CONTACT NOVEL IDEA FILE

Summit p. 8/8

Most of the ^{se} video games were desperately flawed attempts to understand
the future, *she thought*.

Attendance in churches had soared all over America. The Message, Ellie believed, was a kind of mirror in which each person sees his or her own beliefs challenged or confirmed. It was considered a vindication of many mutually exclusive apocalyptic and eschatological doctrines. Catholics debated the extraterrestrial State of Grace. In Peru, Algeria, Mexico, Zimbabwe, Ecuador and among the Hopi, serious public debates took place on whether their progenitor civilizations had come from space; supporting opinions were attacked as colonialist. Protestants discussed possible earlier missions of Jesus to nearby planets, and of course a return ~~visit~~ to Earth. Muslims were concerned that the Message might contravene the commandment ~~against~~ ^{among the Sosafer Chassids.} against graven images. Messianic fervor had arisen ~~in some~~

In other congregations of Orthodox Jews, ~~in others~~, there was ~~(suddenly)~~ ^(a) renewal of interest in Astruc, a zealot fearful that knowledge would undermine faith, who in 1305 had induced the Rabbi of Barcelona, the leading Jewish cleric of the time, to forbid the study of science or philosophy by those under 25, on pain of excommunication. Similar currents were increasingly discernible in Islam. A Thessalonian philosopher, auspiciously named Nicholas Polydemos, was attracting ~~considerable~~ attention with a set of passionate arguments for what he called the "reunification" of the religions, governments and peoples of the world. ^{Critics began by questioning the "re."} UFO groups had organized round-the-clock picketing of Brooks Air Force Base, near San Antonio, where the perfectly preserved bodies of four occupants ~~from a crashed~~ ^{of crashed in 1947} flying saucer were said to be languishing in freezers; the extraterrestrials were reputed to be one

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20 August, 1984

CONTACT NOVEL IDEA FILE

In Iran, a man arose who claimed to be the Hidden Imam of the Shi'ites.

meter tall with tiny, flawless teeth. Apparitions of Vishnu had been reported in India, of the Amida Buddha in Japan; miraculous cures were announced at Lourdes; a new bodhisattva proclaimed herself in

A new Tibet ~~and a tantalizing and innovative cargo cult was imported from~~ *it preached the* ~~which advocated~~ *construction of radiotelescope replicas to attract extraterrestrial* *1955e.* New Guinea into Australia; [^] The World Union of Free Thinkers called

the Message a disproof of the existence of God. The Mormon Church declared it a second revelation by the angel Moroni. It was taken in different places as evidence for many gods or one ^{Smart} god or none.

Chiliasm was rife. ^{Smart} Zealotry, fanaticism, fear, hope, fervent debate, quiet prayer, agonizing reappraisal, closed-minded bigotry, and the zest for entirely new ideas were epidemic, rushing feverishly over the surface of the tiny planet Earth. The Message continued to resist attempts at decryption. But slowly emerging from this mighty ferment, Ellie thought she could see, was a dawning recognition of ^{our} ~~this~~ world as one thread in a vast cosmic tapestry.

On the public vilification and humiliation channels, protected by the First Amendment, she, Vaygay, ^{Der Heer,} ~~DeVries,~~ and to a lesser extent Peter Valerian, were being castigated for a variety of offenses, including atheism, communism, and ^{hoarding} ~~keeping~~ the Message ^{for} ~~to~~ themselves. In her opinion, Vaygay wasn't much of a Communist, Valerian had a deep, quiet but sophisticated Christian faith, and if they were lucky enough to come anywhere near cracking the Message, she was willing to deliver it personally to this sanctimonious twit of a television commentator. David Drumlin, however, was being made out as the hero, the man who had really cracked the prime number and Olympic

Quest, p 8/10.

8 July, 1984

CONTACT NOVEL IDEA FILE

N. H.

There are those who predicted the Millenium in 1999 (as a ^{cabbalistic} ~~capitalistic~~ inversion of 1666, the year that Sabbatai Zevi adopted for his millenium); others chose 1996 or 2033, the presumed 2000th anniversaries of the birth or death of Jesus. Some Chiliasts who believed in the earlier dates had begun giving away their material wealth to the poor -- in part because it would soon be worthless anyway, and in part as earnest money to God, a token of faith, a bribe for the ~~A~~ advent.

broadcasts, and who was the kind of scientist we needed more of. She sighed and changed the channel once again.

She had come around to TABS, the Turner-American Broadcasting System, the only survivor of the large commercial networks that had dominated television broadcasting in the United States until the advent of widespread direct satellite broadcasting and 200 [CHECK] channel cable. Palmer Joss was making one of his rare television appearances. Like most Americans, she instantly recognized his resonant voice, his slightly unkempt good looks, and the discoloration beneath his eyes that made you think he never slept for worrying about the rest of us.

"What has science really done for us?" he declaimed. "Are we really happier? I don't mean just holographic receivers and seedless grapes. Are we fundamentally happier? Or do the scientists bribe us with toys, with technological trinkets, while they undermine our


faith?" *Aren't these the people who ~~taught~~ us ~~to~~ how to ~~the brink of annihilation?~~ annihilate ourselves?*

Here was a man, she thought, who was hankering for a simpler age, a man who has spent his life attempting to reconcile the irreconcilable. He has condemned the most flagrant excesses of pop religion, and thinks that justifies attacks on evolution and relativity. Why not attack the existence of the electron? Palmer Joss never saw one, and the Bible is innocent of electromagnetism. Why believe in electrons? Although she had never before listened to him speak, she was sure that sooner or later he would come around to the Message, and he did:

p. 8/12

"The scientists keep their findings to themselves, give us little bits and pieces -- enough to keep us quiet. They think we're too stupid to understand what they do. They give us conclusions without evidence, findings as if they were Holy writ and not speculations, theories, hypotheses -- what ordinary people would call guesses. They never ask if some new theory is as good for people as the belief that it tries to replace. They overestimate what they know, and underestimate what we know. When we ask for explanations they tell us it takes years to understand. Well, in religion there are also things that take years to understand. ^{And} you can spend a lifetime and never come close to understanding the nature of Almighty God. But you don't see the scientists coming to religious leaders to ask them about their years of study and insight and prayer. They never give us a second thought, except when they mislead us and deceive us.

"And now they say they have a Message from the star Vega. But a star can't send a message. Someone is sending it. Is the purpose of the Message divine, or satanic? When they decode the Message will it end 'Yours truly, God' ^{...} or 'Sincerely, the Devil'? When the scientists get around to telling us what's in the Message, will they tell us the whole truth? Or will they hold something back, because they think we can't understand it, because they think we can't take it, or because it doesn't match what they believe? From p. 8/11.



"I tell you, my friends, science is too important to be left to the scientists. Representatives of the major faiths ought to be part of the process of decoding, ought to be looking at the raw data.

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*Lord, Forgive me, for not being ^{more} grateful
to these kind folks souls.*

(That's what the scientists call it, "raw.") Otherwise . . .

otherwise, where will we be? They'll tell us something. Maybe what they really believe. Maybe not. And we'll have to accept it, whatever they tell us. There are some things the scientists know about. There are other things -- take my word for it -- they know nothing about. Maybe they've received a message from another being in the heavens. Maybe not. Can they be sure the Message isn't a Golden

I don't think they'd know one if they saw one. ✓
Remember, these are the folks who brought us the hydrogen bomb. ✓
Calf? My friend, this is a job for religion.

I have seen God face to face. I worship Him, trust Him, love

Him, with my entire soul, with all of my being. I don't think anyone could believe more than I do. I can't see how the scientists could believe in science more than I do in God. They're ready to throw away their "truths" when a new idea comes around. They're proud of it.

They don't see any end to knowing. They imagine we're locked in ignorance until the end of time, that there's no certainty anywhere in nature. Newton overthrew Aristotle. Einstein overthrew Newton.

Tomorrow someone else ^{will} overthrow Einstein. As soon as we get to understand one theory, there's another ~~one~~ in its place. I wouldn't mind so much if they had warned us that the old ideas were tentative. Newton's law of gravitation, they called it. They still call it that. But if it was a law of nature how could it be wrong? How could it be overthrown? Only God can repeal the laws of nature, not the scientists. They just got it wrong. If Albert Einstein was right, Isaac Newton was an amateur, a bungler.

"Don't forget: the scientists don't always get it right. They wish to take away our faith, our beliefs, and they offer nothing of spiritual value in return. I do not intend to abandon God because the scientists write a book and say it is a message from Vega. I will not worship science. *I will not defy The First Commandment.* I will not bow down before a Golden Calf."

* * *

End of insert to p. 8/11

Der Heer

~~DeVries~~ had asked if they could have a quiet dinner somewhere.

He was flying in for the Summary Session with Vaygay and the Soviet delegation on the latest progress in the interpretation of the Message. But ~~all~~ of south-central [CHECK] New Mexico was crawling with the world's press, and there was no restaurant they could go to where they could talk unobserved and unheard. So she made dinner herself in her modest apartment near the visiting scientists quarters at the ARGUS facility. There was a great deal to talk about. Sometimes it seemed that the fate of the whole project was hanging by

a Presidential thread. But the little tremor of anticipation she felt just before ~~DeVries~~ ^{Ken's} arrival was occasioned, she was vaguely aware, by more than that. ^{Joss was not exactly business, so they got to him while loading the dishwasher.}


"The man is scared stiff. His perspective is ~~so~~ narrow. He imagines the Message is going to be unacceptable biblical ^{exegesis,} ~~commentary,~~ or something that shakes his faith. He has no idea about how a new scientific paradigm subsumes the previous one. He wants to know what science has done for him lately. And he's supposed to be the voice of reason."

"Compared to the Doomsday Chiliasts and the Earth-firsters, Palmer Joss is the soul of moderation. Maybe we haven't explained the methods of science as well as we should have. Us scientists, I mean. I worry about that a lot these days. And Ellie, can you really be sure that it isn't a message from . . . "

"From God or the Devil? Ken, you ^{can't be} ~~re not~~ serious. "

"Well, how about advanced beings committed to what we might call good or evil, who somebody like Joss would consider indistinguishable from God or the Devil?"

"Ken, whoever those beings are in the Vega system, I guarantee they didn't create the universe. They're nothing like an Old Testament God. Remember, Vega, the Sun and all the other stars in the solar neighborhood are in some backwater of an ^{absolutely ordinary} ~~obscure~~ Galaxy. Why should I Am That I Am hang out around here? ^{out}))



"Ellie, we're in a bind. You know Joss has been close to three presidents, including the present incumbent. The President is inclined to make some concession to Joss, although I don't think ^she wants to put him and a bunch of ~~other~~ preachers on the Preliminary Decryption Committee with you, ~~Vaygay and his group~~ ^{colleagues}, Valerian and Drumlin. ^{-- to say nothing of} It's hard to imagine the Russians going along with fundamentalist ~~stump~~ orators on the Committee. The whole thing could unravel over this. Why don't we go and talk to him? The President says that Joss is really fascinated by science. Suppose we won him over?"

"We're going to convert Palmer Joss?"

"I'm not imagining making him change his religion, but just understanding what ARGUS is about, how we don't have to answer the Message if we don't like what it says, how ~~the spaces between the~~ ^{interstellar distances} ~~stars~~ quarantine us from Vega."

"Ken, he doesn't even believe that the velocity of light is a cosmic speed limit. We're going to be talking past each other. Also, I've got a long history of failure in accomodating to the conventional religions. I tend to blow my top at their inconsistencies and hypocrisies. I'm not sure a meeting between Joss and me is what you want. Or the President."

^{"I know who I'd put my money on."}
 "Ellie," he said, ~~looking at her with a glint of admiration,~~
^{And}
~~"You're a wonder."~~ I don't see how getting together with Joss could make things much worse. ["] ~~and I can't wait to see what you two have to say to each other."~~

She allowed herself to return his smile.

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Gennik Arkhangelsky

* * *

Especially with the tracking ships now in place and a few small but adequate radio telescopes installed in such places as Reykjavik and Jakarta, there was now redundant coverage of the signal from Vega at every longitude swath. A major conference was scheduled to be held in Paris in ~~six weeks~~ of the full World Message Consortium. In preparation, it was natural for the two nations with the largest fraction of the data to hold a preparatory scientific discussion. They had been meeting for the better part of four days, and this summary session was intended mainly to bring ~~the~~ ^{those such as Der Heer, serving as} intermediaries, ~~such as DeVries,~~ between the scientists and the politicians, up to speed.

The Soviet delegation, while nominally headed by Lunacharsky, included ^{at least} several Soviet scientists of equal prominence, including ~~A~~ ^{Gennik Arkhangelsky,} as well as ~~the~~ ^{recently named} head of ~~the~~ ^{the} Soviet-led international space consortium called Intercosmos, and ~~AB~~ ^{Der Heer,} listed as ~~Deputy~~ Minister of Medium-Heavy Industry, and a member of the Central Committee. ^{DeVries,} Vaygay clearly felt himself under unusual pressures, because he had resumed chain smoking. He held his cigarette between his thumb and forefinger, palm up, and addressed ~~Der Heer,~~ Kitz, and the political interfaces in the American team.

Anastas Gotsridze,

"I agree that there is adequate overlap in longitude, but I'm still worried about redundancy. A failure in the helium liquifier on board the Akademik Keldysh, or a power failure in Reykjavik and the continuity of the Message is in jeopardy. ~~Let us~~ ^{more} Suppose that the Message takes two years to cycle around to the beginning again. If we miss a piece of the Message we will have to wait two ^{remember,} years to fill in the gap. And we don't know that the Message will be repeated. If there's no repeat, the gaps will never be repaired. I think we need plans even for remote contingencies."

"What are you thinking of," ^{Dr Heer} ~~Devries~~ asked, "something like emergency generators for every observatory in the Consortium?"

"Yes, and ^{amplifiers, autocorrelators, and so forth} ~~several~~ independent magnetic recorders at each ^{We want} ~~so there is~~ observatory. ~~so there is~~ no common point of failure in data acquisition. And some provision for very fast airlift of liquid helium to remote observatories if necessary. And some observatories are still very primitive in their ability to detect polarization modulation. We need maybe 40 copies of the Argus polarimeter."

"Ellie, do you agree?"

"Absolutely."

"Anything else?"

"I think we should continue to observe Vega on a very broad range of frequencies. Perhaps tomorrow a different message will come through on ^{only} one of the message frequencies. We should also continue to monitor other regions in the sky. Maybe the key to the Message won't come from Vega but from somewhere else . . . "

"Let me say why I think Vaygay's point is so important," interjected Valerian. "This is an unprecedented moment, when we're receiving a message but have made no progress at all in decrypting it. We have no previous experience along these lines. We have to cover all the bases. We don't want to wind up a year or two from now kicking ourselves because there was some simple precaution we forgot to take, or some simple measurement that we overlooked. The idea that the Message will cycle back on itself is the merest guess. There ^{is} ~~is~~ *as far as we can see,* nothing in the Message itself [,] that promises cycling back. Any opportunities lost now may be lost for all time. I also ^{agree that} ~~think~~ there's *more instrumental development that needs doing.* ~~is further instrumentation that needs developing.~~ For all we know there's a fourth layer to the palimpsest. Maybe it's at very high time resolution and we're averaging out the modulation. ^{Q: There's} ~~It's~~ also the question of personnel. Suppose this message goes on, not for a year or two but for decades. Or suppose this is just the first in a long series of messages from all over the sky. There are at most a few hundred really capable radio astronomers in the world. That's a very small group of people to rely on when the stakes are this high. The industrialized countries have to start producing ^{many} ~~a lot~~ more radio astronomers and radio engineers with ^{first-rate} ~~the proper~~ training."

Gotsridze, Ellie noted that ~~A.~~, who had said little, was taking detailed notes. She was again struck with how much more literate the Soviets were in English than the Americans in Russian.

"If there is a consensus on these points, we can certainly recommend them in Paris."

"And then," replied Vaygay, "it will be ^{at least} a month after Paris before ~~many~~ of these engineering points can be implemented. What if there's a detector failure before then?"

"All right, I take your point. You would like the United States to allocate some money and resources immediately to start covering these bases."

~~"A baseball analogy, 'covering the bases,' yes?"~~ But not just the United States. I've been urging my colleagues here that the Soviet Union must also move ahead swiftly on these matters. There is no reason why we cannot be responsible for guaranteeing liquid helium resupply to our ocean-going radio telescopes. And Japan and Western Europe should also be encouraged to cover their bases." ✓

^{replied.} "I'm not absolutely sure we can move that fast, but we'll try," ^{Der Heer} "In the worst case, let's ~~try~~ to have at least most of the redundancies in place by the time of the Paris meeting. Maybe Dr. Arroway and Academician Lunacharsky can prepare a list of such items for Minister ^{Gotsridze} ~~3~~ and myself to take back to our respective governments. Does that seem reasonable?"

Lighting a fresh cigarette from the glowing tip of its predecessor, Vaygay nodded a kind of distracted assent.

"There is something else to be said," he went on. "This is just speculation. It's not even as ^{plausible} ~~well supported~~ as the idea that the Message will cycle back on itself -- which Professor Valerian quite properly stressed was only a guess. I would not ordinarily mention so speculative an idea at such an early stage. ^B But if the speculation is

~~sound,~~
~~right,~~ there are certain ^{actions}~~directions~~ we must begin thinking about immediately. I would not have the courage to raise this possibility if Academician ^{Arkhangel'sky}~~X~~ had not come tentatively to the same conclusion. He and I have disagreed about the apparent quantization of quasar red shifts, the explanation of superluminal light sources, the rest mass of the ^{and}~~neutrino,~~ the importance of quark physics in neutron stars, among many other issues. I must admit that sometimes he has been right and sometimes I have been right. Almost never, it seems to me, in the early speculative stage of a subject, have we agreed.

^{Genrikh}~~Vsevolod~~ Dmitri^{ich}~~evich~~, would you explain?"

^{Arkhangel'sky}~~A, who is never called "Vayday,"~~ seemed tolerant, even bemused. His accent was heavier than Vaygay's, but his command of English ~~also~~ was more than adequate.

"We think, we guess," he said, "that the Message is the instructions for building a machine. Of course, we have no knowledge about how to decode the Message. The evidence, such as it is, is in the internal references. For example, here on page 10441 is clearly a reference to an earlier page, 8037, which, by luck, we also have. The later page was acquired here in New Mexico, the earlier one at our observatory near Tashkent. On page 8037 there is another reference, this to a time before we received any data. We have many ~~cases~~ of this back referencing. In general, and this is the important point, there are complicated instructions on a recent page, but ~~references to~~ simpler instructions on an earlier page. In one case there are eight citations to earlier material on a single page."

"That's not an awfully compelling argument, guys," replied Ellie. Maybe it's a set of mental exercises, the later ones building on the earlier ones. Maybe it's a long novel -- they might have very long lifetimes compared to us -- in which the hero's present circumstances are connected with its childhood or whatever they have on Vega when they're young. Maybe it's a tightly cross-referenced religious manual."

^{Ten B}
"The ~~One~~ ^{Million} Commandments," laughed ~~Devries~~ ^{Der Heer}.

"May be," said Lunacharsky, staring through a cloud of cigarette smoke out the window at the telescopes. ^{They seemed to be} straining ~~upward~~ towards the sky. "But when you look at the patterns of cross-references, I think you'll agree, it looks more like the instruction manual for building a machine. God knows what the ^{Machine} is supposed to do."

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Contact: CHAPTER 8

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27 September, 1984

When he was a very young man, before he became widely revered Palmer Joss had been a carnival roustabout. To help make his fortune he arranged for a map of the Earth, in cylindrical projection, to be painstakingly tattooed on his torso. He would exhibit himself in county fairs and sideshows from Oklahoma to Mississippi, one of the stragglers and remnants of a more vigorous age of rural itinerant entertainment. In the expanse of blue ocean were the four gods of the winds, their cheeks puffing forth prevailing westerlies and nor'easters. By flexing his pectorals, he could make Boreas swell along with the mid-Atlantic. Then, he would declaim to the astonished onlookers from Book 6 of Ovid's Metamorphoses:

"Monarch of Violence, rolling on clouds,
I toss wide waters, and I fell huge trees . . .
Possessed of daemon-rage, I penetrate,
Sheer to the utmost caverns of old Earth;
And straining, up from those unfathomed deeps,
Scatter the terror-stricken shades of Hell;
And hurl death-dealing earthquakes throughout the world!"

Fire and brimstone from Ancient Rome. Or, with some help from his hands, he would demonstrate continental drift, pressing West Africa against South America, so they joined almost perfectly at the longitude of his navel. They billed him as "Geos, the Earth Man."

Joss was a great reader, and being unencumbered by a formal education past grade school, he had not been told that science and classics were unseemly fare for the untutored. With casual, rumpled good looks, he would ingratiate himself with librarians in the towns along the Carnival's trek, and ask what serious books he should read. He wanted, he told them, to improve himself. Dutifully, he read about winning friends and investing in real estate and dominating your acquaintances without their knowing, but felt these books somehow shallow, hollow, empty. In ancient literature and in modern science, by contrast, he thought he detected quality. When there were layovers he would haunt the local town or county library. He taught himself some geography and history. They were job-related, he told Elvira, the Elephant Girl, who sometimes questioned him closely on his absences. She suspected him of compulsive dalliances -- a librarian in every port, she once said -- but his professional patter was improving: the contents were a bit highbrow, but the delivery was down home. Unaccountably, Joss' little stall began to make money for the carnival.

He was one day demonstrating, his back to the audience, the collision of India with Asia and the resulting crinkling up of the Himalayas, when, out of a gray but rainless sky, a lightning bolt flashed and struck him dead. There had been twisters in Southeastern Oklahoma, and the weather was unusual throughout the South. He had a perfectly lucid sense of leaving his body -- pitifully crumbled on the sawdust-covered planking, being regarded with caution and awe by

the small crowd -- and rising, rising as if through a long, dark tunnel, slowly approaching a brilliant light. And in the radiance he gradually discerned a figure of heroic, indeed of God-like, proportions.

When he awoke he found a part of himself disappointed to be alive. He was lying on a cot in a comfortable but not elaborately furnished bedroom. Leaning over him was the Reverend Billy Jo Rankin, not the present incumbent of that name, but his father, a venerable surrogate preacher of the third quarter of the 20th Century. In the background, Joss thought he could see a dozen hooded figures singing the Kyrie Eleison, the Greek Orthodox hymn for the dead [CHECK!] But he couldn't be sure.

"Am I gonna live or die?" the young man asked.

"My boy, you're gonna do both."

He really had been dead, they told him afterwards. A doctor had pronounced him dead. But they prayed over him, they sang hymns, and they even intermittently attempted to revive him by body massage (mainly in the vicinity of the Balkans). They had returned him to life. He had been truly and literally reborn. Since this corresponded so well to his own perception of the circumstance, he accepted the explanation, and gladly. While he almost never talked about it, he became convinced of the profundity and significance of the event. He had not been struck dead for nothing. He had not been brought back for no reason.

Under his patron's tutelage, he began to study Scripture. Once seriously considered, the idea of the Resurrection moved him deeply, as did the doctrine of Salvation. He assisted the Reverend Mr. Rankin at first in small ways. He began to fill in for him in the more onerous or more distant preaching assignments. Soon he found a preaching style that was his own, not so much exhortatory as explanatory. In simple language and homely metaphors, he would explain baptism and transubstantiation, [CHECK] the connection of Christian revelation with the myths of classical Greece and Rome. the idea of God's plan for the world, and the conformity of science and religion, when both were properly understood. This was not the conventional preaching, and it ws too ecumenical for many tastes, but it also proved unaccountably popular.

"You've been reborn, Joss," the elder Rankin told him. "So you ought to change your name. Except Palmer Joss is such a fine name for a preacher, you'd be a fool not to keep it."

Like doctors and lawyers, the vendors of religion rarely criticize one another's wares, Joss observed. But one night, incognito, he attended services at the new Church of God, Crusader, to hear the younger Billy Jo Rankin preach. Billy Jo enunciated a stark doctrine of Reward, Retribution and the Rapture. But tonight was a healing night. The curative instrument, the multitudes were told, was the holiest of relics -- holier than a piece of the True Cross, holier even than the thigh bone of St. Teresa of Avila that Generalissimo Francisco Franco kept in his office to intimidate the

pious. What Billy Jo Rankin brandished was the actual amniotic fluid that protected and surrounded our Lord. The liquid had been carefully preserved in an ancient earthenware vessel that once belonged, so it was said, to Saint Ann. The tiniest drop of it would cure what ails you, through a special act of Divine Grace. This holiest of holy waters was with us tonight.

Joss was appalled, not so much that Rankin would attempt so transparent a scam, but that any of the parishioners were so credulous as to accept it. In his previous life, he had witnessed many, and acquiesced in some, attempts to bamboozle the public. But that was entertainment. This was different. This was religion. Religion was too important to gloss the truth, much less to manufacture miracles out of whole cloth. He took to denouncing this imposture from the pulpit. As his fervor grew, he railed against other deviant forms of Christian fundamentalism, including those aspirant herpetologists who tested their faith by fondling snakes in accord with the biblical injunction that "the pure of heart shall not fear the venom of serpents." In one widely quoted sermon he paraphrased Voltaire. He never thought, he said, that he would find men of the cloth so venal and avaricious as almost to justify the blasphemy that the first priest was the first rogue who met the first fool. These religions were damaging religion. He shook his finger gracefully in the air. Joss argued that in every religion there was a doctrinal line beyond which was an insult to the intelligence of its practitioners. Reasonable people might disagree as to where that line should be

drawn, but religions trespassed beyond it at their peril. People were not fools, he said. Shortly before his death, the elder Rankin sent word to Joss that he never wanted to lay eyes on him again.

At the same time, he began to preach, science did not have all the answers either. He found inconsistencies in the theory of evolution. The embarrassing findings, the facts that don't fit, the scientists just sweep under the rug, he said. They don't really know that the Earth is 4.6 billion years old, any more than Archbishop Ussher knew that it was 6,000 years old. Nobody has seen evolution happen, nobody has been counting seconds since the Creation ("Two-hundred-quadrillion-Mississippi . . . " he once imagined the patient timekeeper intoning, counting up the seconds since the origin of the world). And Einstein's theory of relativity was also unproved. You couldn't travel faster than light no matter what, Einstein had said. How could he know? How close to the speed of light had he gone? Relativity was only a way of understanding the world. Einstein couldn't restrict what mankind could do in the far future. And Einstein sure couldn't set limits on what God could do. Couldn't God travel faster than light if He wanted to? Couldn't God make us travel faster than light if He wanted to? There were excesses in science and there were excesses in religion. A reasonable man wouldn't be stampeded by either one. There were many interpretations of Scripture, and many interpretations of the natural world. Both were created by God. Both must be mutually consistent. Wherever a discrepancy seems to exist, either a scientist or a theologian -- maybe both -- haven't been doing their job.

Palmer Joss combined his even-handed criticism of science and religion with a fervent plea for moral rectitude and a respect for the intelligence of his flock. In slow stages he acquired a national reputation. In debates on the teaching of "scientific creationism" in the schools, on the ethical status of abortion and frozen embryos, on the admissibility of genetic engineering, he attempted in his way to steer a middle course, to reconcile conflicting opinions attributed to science and religion. Both contending camps were outraged at his interventions, and his popularity grew. He became a confidant of Presidents. His sermons were excerpted on the Op Ed pages of major secular newspapers. But he resisted the many invitations and some blandishments to found an electronic church. He continued to live simply, rarely -- except for Presidential invitations and ecumenical congresses -- leaving the rural South. Beyond a conventional patriotism, he made it a rule not to meddle in politics. In a field filled with competing entries, many of dubious probity, he became, in erudition and moral authority, the preeminent Christian fundamentalist preacher of his day.

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She ignored random access and idly advanced through the television channels sequentially. There was a spirited basketball game between the Johnson City Wildcats and the Union-Endicott Tigers. The young men and women were endearing in their dedication and seriousness. On the adjacent channel was an exhortation by Imam Mahdi -- speaking in Parsi -- on proper versus improper observances of Ramadan. Next was one of the locked channels, this one apparently devoted to legal but universally abhorrent sexual practices. Beyond was one of the premier computer access channels, dedicated to fantasy role-playing games. Accessed to your home computer, it offered a single entry into a new adventure, today's apparently called "Galactic Gilgamesh," in hopes that you would find it sufficiently attractive to order the corresponding floppy disc on one of the vending channels. Proper electronic precautions were taken so you could not record the program during your single play. As she cycled through the channels, past the Soviet Embassy's Russian language news and comment program, an Oriental cooking series devoted this week to the hibachi, an extended advertisement for the first generation of general purpose home robots by Logan Cybernetics, several children's and news frequencies, the mathematics channel displaying the dazzling computer graphics of the new Cornell analytic geometry course, the local apartments and real estate channel, and a tight cluster of execrable daytime serial stations, she would come upon religious channels where, with sustained and general excitement, the Message was being discussed.

Attendance in churches had soared all over America. The Message, Ellie believed, was a kind of mirror in which each person sees his or her own beliefs challenged or confirmed. It was considered a vindication of many mutually exclusive apocalyptic and eschatological doctrines. Catholics debated the extraterrestrial State of Grace. In Peru, Algeria, Mexico, Zimbabwe, Ecuador and among the Hopi, serious public debates took place on whether their progenitor civilizations had come from space; supporting opinions were attacked as colonialist. Protestants discussed possible earlier missions of Jesus to nearby planets, and of course a return visit to Earth. Muslims were concerned that the Message might contravene the commandment against graven images. Messianic fervor had arisen in some congregations of Orthodox Jews. In others, there was suddenly a renewal of interest in Astruc, a zealot fearful that knowledge would undermine faith, who in 1305 had induced the Rabbi of Barcelona, the leading Jewish cleric of the time, to forbid the study of science or philosophy by those under 25, on pain of excommunication. Similar currents were increasingly discernible in Islam. A Thessalonian philosopher, auspiciously named Nicholas Polydemos, was attracting considerable attention with a set of passionate arguments for what he called the "reunification" of the religions, governments and peoples of the world. UFO groups had organized round-the-clock picketing of Brooks Air Force Base, near San Antonio, where the perfectly preserved bodies of four occupants from a crashed flying saucer were said to be languishing in freezers; the extraterrestrials were reputed to be one

meter tall with tiny, flawless teeth. Apparitions of Vishnu had been reported in India, of the Amida Buddha in Japan; miraculous cures were announced at Lourdes; a new bodhisattva proclaimed herself in Tibet; and a tantalizing and innovative cargo cult was imported from New Guinea into Australia. The World Union of Free Thinkers called the Message a disproof of the existence of God. The Mormon Church declared it a second revelation by the angel Moroni. It was taken in different places as evidence for many gods or one God or none. Chiliasm was rife. Zealotry, fanaticism, fear, hope, fervent debate, quiet prayer, agonizing reappraisal, closed-minded bigotry, and the zest for entirely new ideas were epidemic, rushing feverishly over the surface of the tiny planet Earth. The Message continued to resist attempts at decryption. But slowly emerging from this mighty ferment, Ellie thought she could see, was a dawning recognition of this world as one thread in a vast cosmic tapestry.

On the public vilification and humiliation channels, protected by the First Amendment, she, Vaygay, DeVries, and to a lesser extent Peter Valerian, were being castigated for a variety of offenses, including atheism, communism, and keeping the Message to themselves. In her opinion, Vaygay wasn't much of a Communist, Valerian had a deep, quiet but sophisticated Christian faith, and if they were lucky enough to come anywhere near cracking the Message, she was willing to deliver it personally to this sanctimonious twit of a television commentator. David Drumlin, however, was being made out as the hero, the man who had really cracked the prime number and Olympic

broadcasts, and who was the kind of scientist we needed more of. She sighed and changed the channel once again.

She had come around to TABS, the Turner-American Broadcasting System, the only survivor of the large commercial networks that had dominated television broadcasting in the United States until the advent of widespread direct satellite broadcasting and 200 [CHECK] channel cable. Palmer Joss was making one of his rare television appearances. Like most Americans, she instantly recognized his resonant voice, his slightly unkempt good looks, and the discoloration beneath his eyes that made you think he never slept for worrying about the rest of us.

"What has science really done for us?" he declaimed. "Are we really happier? I don't mean just holographic receivers and seedless grapes. Are we fundamentally happier? Or do the scientists bribe us with toys, with technological trinkets, while they undermine our faith?"

Here was a man, she thought, who was hankering for a simpler age, a man who has spent his life attempting to reconcile the irreconcilable. He has condemned the most flagrant excesses of pop religion, and thinks that justifies attacks on evolution and relativity. Why not attack the existence of the electron? Palmer Joss never saw one, and the Bible is innocent of electromagnetism. Why believe in electrons? Although she had never before listened to him speak, she was sure that sooner or later he would come around to the Message, and he did:

"The scientists keep their findings to themselves, give us little bits and pieces -- enough to keep us quiet. They think we're too stupid to understand what they do. They give us conclusions without evidence, findings as if they were Holy writ and not speculations, theories, hypotheses -- what ordinary people would call guesses. They never ask if some new theory is as good for people as the belief that it tries to replace. They overestimate what they know, and underestimate what we know. When we ask for explanations they tell us it takes years to understand. Well, in religion there are also things that take years to understand. You can spend a lifetime and never come close to understanding the nature of Almighty God. But you don't see the scientists coming to religious leaders to ask them about their years of study and insight and prayer. They never give us a second thought, except when they mislead us and deceive us.

"And now they say they have a Message from the star Vega. But a star can't send a message. Someone is sending it. Is the purpose of the Message divine, or satanic? When they decode the Message will it end 'Yours truly, God' or 'Sincerely, the Devil'? When the scientists get around to telling us what's in the Message, will they tell us the whole truth? Or will they hold something back, because they think we can't understand it, because they think we can't take it, or because it doesn't match what they believe?

"I tell you, my friends, science is too important to be left to the scientists. Representatives of the major faiths ought to be part of the process of decoding, ought to be looking at the raw data.

(That's what the scientists call it, "raw.") Otherwise . . . otherwise, where will we be? They'll tell us something. Maybe what they really believe. Maybe not. And we'll have to accept it, whatever they tell us. There are some things the scientists know about. There are other things -- take my word for it -- they know nothing about. Maybe they've received a message from another being in the heavens. Maybe not. Can they be sure the Message isn't a Golden Calf? My friend, this is a job for religion.

I have seen God face to face. I worship Him, trust Him, love Him, with my entire soul, with all of my being. I don't think anyone could believe more than I do. I can't see how the scientists could believe in science more than I do in God. They're ready to throw away their "truths" when a new idea comes around. They're proud of it. They don't see any end to knowing. They imagine we're locked in ignorance until the end of time, that there's no certainty anywhere in nature. Newton overthrew Aristotle. Einstein overthrew Newton. Tomorrow someone else will overthrow Einstein. As soon as we get to understand one theory, there's another one in its place. I wouldn't mind so much if they had warned us that the old ideas were tentative. Newton's law of gravitation, they called it. They still call it that. But if it was a law of nature how could it be wrong? How could it be overthrown? Only God can repeal the laws of nature, not the scientists. They just got it wrong. If Albert Einstein was right, Isaac Newton was an amateur, a bungler.

Don't forget: the scientists don't always get it right. They wish to take away our faith, our beliefs, and they offer nothing of spiritual value in return. I do not intend to abandon God because the scientists write a book and say it is a message from Vega. I will not worship science. I will not bow down before a Golden Calf."

* * *

DeVries had asked if they could have a quiet dinner somewhere. He was flying in for the Summary Session with Vaygay and the Soviet delegation on the latest progress in the interpretation of the Message. But all of south central [CHECK] New Mexico was crawling with the world's press, and there was no restaurant they could go to where they could talk unobserved and unheard. So she made dinner herself in her modest apartment near the visiting scientists quarters at the ARGUS facility. There was a great deal to talk about. Sometimes it seemed that the fate of the whole project was hanging by

a Presidential thread. But the little tremor of anticipation she felt just before DeVries' arrival was occasioned, she was vaguely aware, by more than that.

"The man is scared stiff. His perspective is so narrow. He imagines the Message is going to be unacceptable biblical commentary, or something that shakes his faith. He has no idea about how a new scientific paradigm subsumes the previous one. He wants to know what science has done for him lately. And he's supposed to be the voice of reason."

"Compared to the Doomsday Chiliasts and the Earth-firsters, Palmer Joss is the soul of moderation. Maybe we haven't explained the methods of science as well as we should have. Us scientists, I mean. I worry about that a lot these days. And Ellie, can you really be sure that it isn't a message from . . . "

"From God or the Devil? Ken, you're not serious. "

"Well, how about advanced beings committed to what we might call good or evil, who somebody like Joss would consider indistinguishable from God or the Devil?"

"Ken, whoever those beings are in the Vega system, I guarantee they didn't create the universe. They're nothing like an Old Testament God. Remember, Vega, the Sun and all the other stars in the solar neighborhood are in some backwater of an obscure Galaxy. Why should I Am That I Am hang out around here?

"Ellie, we're in a bind. You know Joss has been close to three presidents, including the present incumbent. The President is inclined to make some concession to Joss, although I don't think he wants to put him and a bunch of other preachers on the Preliminary Decryption Committee with you, Vaygay and his group, Valerian and Drumlin. It's hard to imagine the Russians going along with fundamentalist stump orators on the Committee. The whole thing could unravel over this. Why don't we go and talk to him? The President says that Joss is really fascinated by science. Suppose we won him over?"

"We're going to convert Palmer Joss?"

"I'm not imagining making him change his religion, but just understanding what ARGUS is about, how we don't have to answer the Message if we don't like what it says, how the spaces between the stars quarantine us from Vega."

"Ken, he doesn't even believe that the velocity of light is a cosmic speed limit. We're going to be talking past each other. Also, I've got a long history of failure in accomodating to the conventional religions. I tend to blow my top at their inconsistencies and hypocrisies. I'm not sure a meeting between Joss and me is what you want. Or the President."

"Ellie," he said, looking at her with a glint of admiration, "You're a wonder. I don't see how getting together with Joss could make things much worse, and I can't wait to see what you two have to say to each other."

She allowed herself to return his smile.

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Especially with the tracking ships now in place and a few small but adequate radio telescopes installed in such places as Reykjavik and Jakarta, there was now redundant coverage of the signal from Vega at every longitude swath. A major conference was scheduled to be held in Paris in six weeks of the full World Message Consortium. In preparation, it was natural for the two nations with the largest fractions of the data to hold a preparatory scientific discussion. They had been meeting for the better part of four days and this summary session was intended mainly to bring the intermediaries, such as DeVries, between the scientists and the politicians up to speed. The Soviet delegation, while nominally headed by Lunacharsky, included several Soviet scientists of equal prominence, including A, as well as AB, listed as Deputy Minister of Medium Heavy Industry, and a member of the Central Committee. Vaygay clearly felt himself under unusual pressures, because he had resumed chain smoking. He held his cigarette between his thumb and forefinger, palm up, and addressed DeVries, Kitz, and the political interfaces in the American team.

"I agree that there is adequate overlap in longitude, but I'm still worried about redundancy. A failure in the helium liquifier on board the Akademik Keldysh or a power failure in Reykjavik and the continuity of the Message is in jeopardy. Let us suppose that the Message takes two years to cycle around to the beginning again. If we miss a piece of the Message we will have to wait two years to fill in the gap. And we don't know that the Message will be repeated. If there's no repeat the gaps will never be repaired. I think we need plans even for remote contingencies."

"What are you thinking of," DeVries asked. "something like emergency generators for every observatory in the Consortium?"

"Yes, and several independent magnetic recorders at each observatory so there is no common point of failure in data acquisition. And some provision for very fast airlift of liquid helium to remote observatories if necessary. And some observatories are still very primitive in their ability to detect polarization modulation. We need maybe 40 copies of the Argus polarimeter."

"Ellie, do you agree?"

"Absolutely."

"Anything else?"

"I think we should continue to observe Vega on a very broad range of frequencies. Perhaps tomorrow a different message will come through on one of the message frequencies. We should also continue to monitor other regions in the sky. Maybe the key to the Message won't come from Vega but from somewhere else . . . "

"Let me say why I think Vaygay's point is so important," interjected Valerian. "This is an unprecedented moment, when we're receiving a message but have made no progress at all in decrypting it. We have no previous experience along these lines. We have to cover all the bases. We don't want to wind up a year or two from now kicking ourselves because there was some simple precaution we forgot to take or some simple measurement that we overlooked. The idea that the Message will cycle back on itself is the merest guess. There is nothing in the Message itself that promises cycling back. Any opportunities lost now may be lost for all time. I also think there is further instrumentation that needs developing. For all we know there's a fourth layer to the palimpsest. Maybe it's at very high time resolution and we're averaging out the modulation. It's also the question of personnel. Suppose this message goes on not for a year or two but for decades. Or suppose this is just the first in a long series of messages from all over the sky. There are at most a few hundred really capable radio astronomers in the world. That's a very small group of people to rely on when the stakes are this high. The industrialized countries have to start producing a lot more radio astronomers and radio engineers with the proper training."

Ellie noted that B, who had said little, was taking detailed notes. She was again struck with how much more literate the Soviets were in English than the Americans in Russian.

"If there is a consensus on these points, we can certainly recommend them in Paris."

"And then," replied Vaygay, "it will be a month after Paris before many of these engineering points can be implemented. What if there's a detector failure before then?"

"All right, I take your point. You would like the United States to allocate some money and resources immediately to start covering these bases."

"A baseball analogy, 'covering the bases,' yes? But not just the United States, I've been urging my colleagues here that the Soviet Union must also move ahead swiftly on these matters. There is no reason why we cannot be responsible for guaranteeing liquid helium resupply to our ocean-going radio telescopes. And Japan and Western Europe should also be encouraged to cover their bases."

"I'm not absolutely sure we can move that fast, but we'll try. In the worst case, let us try to have at least most of the redundancies in place by the time of the Paris meeting. Maybe Dr. Arroway and Academician Lunacharsky can prepare a list of such items for Minister B and myself to take back to our respective governments. Does that seem reasonable?"

Lighting a fresh cigarette from the glowing tip of its predecessor, Vaygay nodded a kind of distracted assent.

"There is something else to be said," he went on. "This is just speculation. It's not even as well supported as the idea that the Message will cycle back on itself -- which Professor Valerian quite properly stressed was only a guess. I would not ordinarily mention so speculative an idea at such an early stage but if the speculation is

right, there are certain directions we must begin thinking about immediately. I would not have the courage to raise this possibility if Academician A had not come tentatively to the same conclusion. He and I have disagreed about the apparent quantization of quasar red shifts, the explanation of superluminal light sources, the rest mass of the neutrino, the importance of quark physics in neutron stars, among many other issues. I must admit that sometimes he has been right and sometimes I have been right. Almost never, it seems to me, in the early speculative stage of a subject, have we agreed.

Vsevelod Dmitrivich, would you explain?"

A, who is never called "Vayday," seemed tolerant, even bemused. His accent was heavier than Vaygay's, but his command of English also was more than adequate.

"We think, we guess," he said, "that the Message is the instructions for building a machine. Of course, we have no knowledge about how to decode the Message. The evidence, such as it is, is in the internal references. For example, here on page 10441 is clearly a reference to an earlier page, 8037, which, by luck, we also have. The later page was acquired here in New Mexico, the earlier one at our observatory near Tashkent. On page 8037 there is another reference, this to a time before we received any data. We have many case of this back referencing. In general, and this is the important point, there are complicated instructions on a recent page, but references to simpler instructions on an earlier page. In one case there are eight citations to earlier material on a single page."

"That's not an awfully compelling argument, guys," replied Ellie. Maybe it's a set of mental exercises, the later ones building on the earlier ones. Maybe it's a long novel -- they might have very long lifetimes compared to us -- in which the hero's present circumstances are connected with its childhood or whatever they have on Vega when they're young. Maybe it's a tightly cross-referenced religious manual."

"The one million commandments," laughed DeVries.

"May be," said Lunacharsky, staring through a cloud of cigarette smoke out the window at the telescopes straining upward towards the sky. "But when you look at the patterns of cross references I think you'll agree it looks more like the instruction manual for building a machine. God knows what the Machine is supposed to do."

Second draft

Chap. 9 & Sept 27, 1984 version

CS

Sound Draft

Contact: CHAPTER 9

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31 August, 1984

THE NUMINOUS

She could recall the exact ~~the~~ moment when, on one of many trips to Washington, she ^{suspected} ~~decided~~ that she ^{was} ~~must~~ be falling in love with ~~Der Heer~~ DeVries. Arrangements for the meeting with Palmer Joss seemed to be taking forever. Apparently, Joss was reluctant to visit the Argus facility; it was the impiety of the scientists, not their interpretation of the Message, he now said, that interested him. And to probe their character, some more neutral ground was needed. Ellie was willing to go anywhere, and a special assistant to the President was negotiating. Other radio astronomers -- Valerian or Drumlin, say, much less Vaygay -- were not to go. The President wanted it to be Ellie alone. ^{Ellie} She was also waiting for the day, still some ~~months~~ ^{weeks} off, ^{when} ~~on which~~ she would fly to Paris for the first full meeting of the World Message Consortium. She and Vaygay were coordinating the global data collection program. The signal acquisition was now fairly routine, and there had been, in recent months, not one gap in the coverage. So she found, to her surprise, that she had a little time on her hands. She vowed to have a long talk with her mother, and to remain civil and friendly no matter what provocation was offered. There was an absurd amount of backed-up paper and electronic mail to go through -- not just congratulations and criticism from colleagues, but religious admonitions and fan mail from all over the world. She had not read The Astrophysical Journal in months, although she was the first author on a very recent paper that was surely the

most extraordinary article that had ever appeared in that august publication. There were other meritorious radioastronomy programs ^{at the facility} -- the quasar survey, for example -- that needed attending to. But instead of doing all these things, she found herself ^{increasingly} spending ^{her} ~~increasing~~ time with Ken.

She felt it her duty to involve the President's Science Advisor as deeply as he wished in Project Argus. It was important for the project that the President be fully and competently informed. She hoped the leaders of other nations would be as thoroughly briefed on the findings from Vega as was the President of the United States. This President, while untrained in science, genuinely liked the subject, enjoyed understanding some aspects of nature of which she had previously been ignorant, and was willing to support science not only for its practical benefits but, at least a little, for the joy of knowing. This had been true of few previous American leaders since James Madison and John Quincy Adams.

Still, it was remarkable how much time ^{Dor Heer} ~~DeVries~~ was able to spend at Argus. He did, it was true, devote an hour or more each day in high-bandpass scrambled communications with his Office of Science and Technology Policy in the Old Executive Office Building. But the rest of the time, as far as she could see, he was simply . . . around. He would poke into the innards of the computer system, or seemingly randomly selected ^{elements} ~~components~~ of the radio telescope array. Sometimes he would have with him a technician from his office; more often he

would be alone. Occasionally she would see him through the open door of the spare office they had assigned him, his feet propped up on the desk, reading some report, ~~prepared for him~~. He would offer her a cheery wave ^{and return to his work.} She would find him talking casually with Drumlin or Valerian; but equally so with junior technicians, and with the secretarial staff, who had on more than one occasion pronounced him, within Ellie's hearing, "charming."

^{Der Heer}
~~DeVries~~ had many questions for her as well. At first they were purely technical and programmatic, but ^{soon they} ~~then~~ extended ~~rapidly~~ ^{into} speculation ~~about~~ and plans for a wide variety of conceivable future events. These days, it almost seemed, discussion of the project was a pretext to spend a little time together.

One fine autumn afternoon in Washington, the President was obliged to delay a meeting of the Special Contingency Task Group because of the Tyrone Free crisis. After an overnight flight from New Mexico, Ellie and ^{Der Heer} ~~DeVries~~ found themselves with an unscheduled few hours, and decided to visit the Viet Nam Memorial, ^{designed by Maya Ying Lin, when she was still an undergraduate architectural student at Yale.} Amidst the sombre and doleful reminders of a foolish war ~~by which the United States finally drained an enormous reservoir of global goodwill while killing more than a million people [CHECK] in the process~~ ^{Der Heer} ~~DeVries~~ seemed ^{again} ~~reluctantly~~ to speculate about flaws in his character. ^{A pair of General Services Administration plainclothes security people -- with custom-molded ear-pieces discreetly in place -- followed inconspicuously.}

He had coaxed an exquisite blue caterpillar [APPROPRIATE FOR AUTUMN?] to climb aboard a twig. Briskly, it crawled along the stick, its iridescent body rippling with the motion of fourteen pairs of feet. It reached the end, held on with its last five segments, and flailed in the air in a plucky attempt to find a new perch.

Unsuccessful, it turned itself around smartly and retraced its many steps. ^{Der Herr} ~~DeVries~~ then changed his clutch on the twig to the opposite end, so that, when the caterpillar returned to its starting point, there was again nowhere to go. Like some caged mammalian carnivore, it paced back and forth, eight, nine, ten, eleven times, but in the last few passages, it seemed to her, with increasing resignation. ^e She was beginning to feel pity for the poor creature, even if it proved to be, say, the larva responsible for the barley blight.

"What a wonderful program in this guy's head! It works every time. Optimum escape software. And the caterpillar never falls off. I mean the twig is effectively suspended in air. The caterpillar never experiences this in nature. The twig is always connected to something. Ellie, did you ever wonder what that program would feel like if it was in your head? I mean, would it just seem obvious to you what you should do when you come to the end of a stick? Would you have the impression that you were thinking it through? Would you ever wonder how you knew to shake your front ten feet in the air, but be sure to hold on tight with the other eighteen?"

She remembered how common it was for American soldiers to decry their Vietnamese adversaries as "gooks," "slopeheads," "slanteyes," and worse. How could we maneuver ~~this imminent~~ ^{the next} phase of human history without really grappling with our penchant for dehumanizing the adversary of the moment.

* on the national conscience that no President yet had had the courage to lance. Considering his position and background, Ken's ~~renewed~~ ^{renewed} views on the matter were a pleasant surprise. She inclined her head slightly and examined him closely. He seemed to experience little difficulty imagining her as a caterpillar. Was he now contemplating some further abuse of

invertebrates? She tried to reply noncommittally, reminding herself that for him this might be a matter of professional interest.

"What'll you do with it now?"

"I'll put it back down in the grass, I guess. What else would I do with it?"

"Some people might kill it."

"It's hard to kill a creature once it lets you see its consciousness." ~~Look around us.~~ He waved at the 30,000 names engraved in the reflecting black granite [CHECK]. "That's why every government that prepares for war paints its adversaries as monsters. They don't want you thinking of the other side as ^{human beings} ~~guys~~ who can think and feel].

"Here, look at this creature. Really. Look closely. Watch what it does. _____ is its official name. If it was as big as you or me, it would scare everybody to death. It would be a genuine monster, right? But it's little, eats leaves, minds its own business, and adds a little beauty to the world. Now look how big we are. How do we look to it? ~~Who are the monsters?~~"

She took the hand not preoccupied with the caterpillar, and they walked wordlessly past ~~tens of ranks~~ of names inscribed in meticulous ~~chronological~~ ~~of the date of their deaths~~ ~~alphabetical~~ order. ~~[CARL: THE NAMES ARE NOT ALPHABETICAL; THEY ARE LISTED IN THE CHRONOLOGICAL ORDER OF THE DATES ON WHICH EACH VETERAN DIED. /sja]~~ These were, of course, only the American casualties. Except in the hearts of their families and friends, there was no memorial, anywhere on the planet ~~of~~ ^{for} the million [CHIC] human beings from South-East Asia who had also died in the conflict. The most common public comment about war -- on the rare occasions when it was referred to, ^{at all} in America -- about political hamstringing of military power, psychologically he thought, to the "stab-in-the-back" explanation by Germanists about losing World War I. The Vietnam war was a pustule *

* * * *

In every day conversation,

DerHeer If you met him at the corner newsstand buying a paper, you'd never guess he was a scientist.
DeVries didn't talk like a scientist. Brought up in Manhattan,

the son of rare Afrikaaner immigrants from what was then called the Union of South Africa, he never fully lost his New York street accent. At first the apparent incongruity between his language and the ^{quality} ~~brilliance~~ of his scientific work seemed amusing to his colleagues. As his research and the man himself became better known, his accent became merely idiosyncratic. But his pronunciation of, say, guanosine triphosphate, seemed to give this benign molecule explosive properties.

An Ebenezer Baptist minister from North Carolina named Tyrone Free had been jailed for insufficiently non-violent protests against ^{support proxy American} ~~direct~~ American economic and military support for the Republic of South Africa. ^{The} ~~a~~ regime ^{long} ~~that~~ had become increasingly repressive ^{on of} ~~ve~~ towards its black majority. ^{South African} As the winds of revolution began to stir, there was in the United States a massive outpouring of domestic protest -- largely, but by no means exclusively, among blacks -- and urgent but quiet protests from many of America's nominal allies. The oppression

-- covered by the Afrikaans euphemism "apartheid," apartness -- was finally seeping into the well-guarded consciousness of the average white American.

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was so heavy-handed and the official South African racism so blatant that the traditional American posture of support for any nation,

however brutal, that declared itself anti-communist was ~~in this case~~ *beginning to improve an embarrassment.* ~~more difficult to sustain.~~ So the United States put some nominal

distance between itself and South Africa, condemning apartheid at the United Nations ~~and warning that~~ *and warning that* ~~communist~~ *a real naval* ~~embargo was~~ *a reluctant possibility if steps were not taken towards representative democracy.** ~~But as~~ *the United States,* it did not wish publicly to be perceived as succumbing to pressure, it proceeded harshly against the preacher from Chapel Hill. All over America, in signs and chants, were the words, "Free Free." The phrase took on a ~~panegyric~~ life of its own. It was an exhortation of this sort, scrawled on a bridge abutment at the foot of Wisconsin Avenue in Georgetown, that she had noticed through the window of the moving government vehicle.

~~DerHeer~~ *DerHeer* ~~DeVries~~ *DeVries* had followed her gaze. "It's mainly jet engines," he had said. "If we could find ~~some~~ *an appropriate* high temperature alloy ~~for jet engines~~ that didn't need strategic metals from South Africa, we could get out of this mess. I don't think there's any significant support for South Africa in this country because it's a racist prison camp. ~~If we were~~ *But* really concerned about communism there we'd be supporting the revolution. ~~I know I'm only the President's Science Advisor and not the National Security Advisor,~~ but I don't want us to take sides with South Africa. It's stupid, it's morally wrong, and it's gonna get us into a kind of trouble that jet engines aren't gonna bail us out of."

** [continuing, Shirl]. South Africa denounced these statements as interference in its internal affairs, and pointed to the disparity between black and white incomes in America. The Soviet Union suggested that the American actions were too little and too late, and proposed a United Nations naval blockade, and volunteered elements of its Indian Ocean Fleet for the purpose. There was domestic debate on the difference between an embargo and a blockade, and U.S. / Soviet relations ~~became~~ *underwent the worst strain in years.* ~~Voices were heard urging, for strategic reasons, U.S. military support for South Africa against this~~ *new Soviet threat.**

~~"And there's another reason, too, isn't there?" she had murmured softly.~~

"Sure there is. If we get into a war on South Africa's side, a lot of people are gonna say it was my doing, because my folks came from South Africa. There's already been a hint in the Washington Post that I'm a secret champion -- that's what they said, 'a secret champion' -- of South Africa. I don't think the President would give me the time of day on this issue."

~~"And were you a secret champion?"~~

~~"Nothing secret about it. "~~ "It's part of my job to remind the President about the strategic mineral implications of this or that war, strategic commodity stockpiles, and ~~especially~~ the possibility of substitute metals and alloys. I had to go along with the CIA estimate, and I had to tell him that there's no replacement alloy; at least none that anyone knew about. "

"I suppose there are some nifty new alloys that you can make from ordinarily immiscible metals at zero g, but the production rate in low-Earth orbit is clearly too low to solve your problem, right? In the foreseeable future anyway. But what's wrong with powder metallurgy? And aren't there any significant deposits of tantalum, or whatever it is you need, in Zambia or Namibia or Botswana? Why don't you pry those countries away from South Africa?"

"Ellie, you've missed your calling," he had said, without a hint of outraged territoriality. *But he didn't actually say that any of ^{her} these suggestions were feasible ~~tenable~~ alternatives.*

* * * *

They had been very slow in recognizing that they were falling in love. It must have been apparent to many others. A few weeks before, when Lunacharsky was still at Argus, he launched ~~himself on~~ one of his episodic tirades on the irrationality of language. This time, it was the turn of American English.

"Ellie, ~~tell me about 'glom.'~~ Why can't you just 'glom'?" he asked. ~~"Why must you always glom on? And why do you say 'make the same mistake again'?~~ What does the 'again' do for the sentence? And am I right that 'burn down' and 'burn up' mean the same thing? 'Slow down' and 'slow up' mean the same thing?"

She nodded wanly. She had heard him more than once complain to his Soviet colleagues on the inconsistencies of the Russian language, and was sure she would hear a French edition of ^{all} this at the Paris conference. She was happy to admit that languages had infelicities, but they had so many sources and evolved from so many small pressures that it would be astonishing if they were perfectly coherent and internally consistent. Vaygay had such a good time complaining, though, that she did not have the heart to remonstrate with him.

"And now take this phrase 'head over heels in love'" he continued. "This is a common expression, yes? But it's exactly backwards, ^{or, rather, upside down.} You are ordinarily head over heels. Horses are head over heels. Chickens are head over heels. When you are in love you should be heels over head. Am I right? You would know ^{about} ~~what~~ falling in love. ~~is like~~. But whoever invented this phrase did not know about love. He imagined you walk around in the usual way, instead of floating upside down in the air, like the paintings of that French painter -- what's his name?"

Marc Chagall had provided a narrow pathway out of a somehow awkward conversational thicket. ~~but~~ afterward, she wondered if Vaygay had been teasing her, or probing for a response. Perhaps he had only unconsciously recognized the growing bond between Ellie and ~~Devries~~. ^{Der Heer.}

At least part of ^{Der Heer's} ~~Devries'~~ reluctance was clear. Here he was, the President's Science Advisor, devoting ^{an enormous amount} ~~a great deal~~ of time on an unprecedented, delicate and volatile matter. To become emotionally involved with one of the principals was risky. The President clearly wanted his judgement unimpaired. He should be able to recommend courses of action that Ellie opposed, and to urge rejection of options that she supported. Falling in love with Ellie would on some level compromise ^{Der Heer's} ~~Devries'~~ effectiveness.

For Ellie it was more complicated. Before she had acquired the somewhat staid respectability of the Director of a major radio observatory, she had had many partners. While she had felt herself in love and declared herself so, marriage -- except for the brief

period with Fredrick -- had never seriously tempted her. She dimly remembered the couplet -- was it William Butler Yeats? -- with which she had tried to reassure her early swains, heartbroken because, as always, she had determined that the affair was over: "You say there is no love, my love, unless it lasts for aye./Ah, folly, there are episodes far better than the play."

*Dreams about
blue caterpillars*

~~On the most superficial level her reluctance about deep commitment was simply because she had never enjoyed that depth of feeling. But she knew there were many deeper psychological layers.~~

9)

She recalled how charming John Staughton had been to her while ~~he was~~ courting her mother; and how easily he had cast off this pose

~~more readily than a butterfly its crysallis~~ after he became her stepfather. ~~(She recognized that the metaphor was imperfect.)~~ Some

(She had dreamt about Staughton and Ken and the blue caterpillar, but the details of the dream work eluded her.)

new and monstrous persona, hitherto barely glimpsed, could emerge in men shortly after you married them. Her romantic predispositions made her vulnerable, she thought. ~~She had no intention of becoming a patsy for some academic martinet, swollen with imagined self-importance.~~ She was not going to repeat her mother's mistake. ~~And~~ Deeper still, she was dimly aware, was a fear of falling in love without reservation, committing her ^{self} love to someone who might then be snatched from her.

The subsequent emotional alternatives would then all be dismal. But if you never really fall in love, you can never really miss it. (This sentiment did not ring quite true, ~~either~~, and in her ruminations she rushed quickly past it.) Also, if she never really fell in love with

someone, she could never really betray him, as in her heart of hearts she felt her mother had betrayed her ~~long~~ dead father. She still grieved for him. (st)

With Ken it seemed to be different. Or had her expectations been *gradually lowered over the years?* ~~eroded by her long self-imposed exile from the land of love?~~ Unlike many other men she could think of, when challenged or stressed, Ken displayed a gentler, more compassionate side ~~of unmistakable integrity~~. His tendency to compromise, his skill in scientific politics, ~~turned out to be~~ ^{were} part of the accoutrements of his job; but underneath she felt ~~sure~~ she had glimpsed a deeper commitment to people and to principle (although ~~the hollow sound of~~ ^{hollow} putting these ideas into words reminded her of how cynical the times had become). She respected him enormously for the way he had integrated science into the whole of his life, the courageous support for science that he had inculcated into two administrations. ~~They~~ ^{ff} had, as discretely ~~as~~ possible, been more or less living together in her small apartment at Argus. Their conversations were a joy, ideas flying back and forth like shuttlecocks, each responding to the other's uncompleted thought with almost perfect knowledge of where it was headed. He was a considerate and inventive lover. And anyway, she liked his pheromones.

She was also delighted and sometimes amazed at what she was able to do and say in his presence, because of their love. She admired him so much that his love for her affected her own self-esteem. She liked

herself better because of him. And since he ^{clearly} felt the same, there was a kind of infinite regress of love and respect underlying their relationship. In the presence of so many of her friends, she had still felt an undercurrent of loneliness. With Ken, it was gone.

She felt comfortable describing to him ~~her~~ reveries, snatches of memories, childhood embarrassments. And he was not merely interested, but fascinated. He would question her for hours about her childhood. His questions were always direct and sometimes probing, but without exception gentle. She began to understand why lovers talk baby talk to one another. There was no other socially acceptable circumstance in which the children inside her were permitted to come out. If the one-year-old, the five-year-old, the twelve-year-old, and the twenty-year-old all find compatible personalities in the beloved, there is a real chance to keep all of these sub-personas happy. Love ends their long loneliness. Perhaps the depth of love can be calibrated by the number of different selves that are actively involved in a given relationship. With her previous partners, it seemed, at most one of these selves was able to find a compatible opposite number; the other personas were grumpy hangers-on.

as the late-afternoon sunlight, ~~fittingly~~ admitted between the slats of the venetian blinds, played patterns on their intertwined forms.

"There must be some number," Ellie said, "which measures the total population of intelligent beings in the Milky Way. How many do you suppose it is? If there's a million civilizations, each with

about a billion individuals, that's ten to the fifteenth power intelligent beings. But if most of them are more advanced than we are, maybe the idea of individuals becomes inappropriate; maybe that's just another Earth chauvinism."

"Sure. And then you can calculate the galactic production rate of Gauloises and Twinkies and Volga sedans and Sony pocket communicators. Then we could calculate the gross galactic product. Once we have that in hand we could work on the gross cosmic . . . "

"You're making fun of me," she said with a soft smile, not at all displeased. "But think of such numbers. I mean really think about them. All those planets with all those beings, more advanced than we are. Don't you get a kind of tingle thinking about it? Here, look at this. "

She reached toward the bedside table for Volume 16 of the Encyclopaedia Britannica Macropaedia, titled "Rubens to Somalia," and opened to a page, into which a scrap of computer printout had been inserted as a page marker. She pointed to an article called "Sacred or Holy."

"The theologians seem to have recognized a special, non-rational -- I wouldn't call it irrational -- aspect of the feeling of sacred or holy. They call it 'numinous.' The term was first used by somebody named Rudolph Otto in a 1923 book, The Idea of the Holy. He believed that humans were predisposed to detect and revere the numinous. He called it the misterium tremendum. Even my Latin is

good enough for that. In the presence of the misterium tremendum, people feel utterly insignificant, but, if I read this right, not personally alienated. He thought of the numinous as a thing 'wholly other,' and the human response to it as 'absolute astonishment.' Now, if that's what religious people talk about when they use words like sacred or holy, I'm with them. I felt something like that just in listening for a signal, never mind in actually receiving it. I think all of science elicits that sense of awe.

"Now listen to this." She read from the text: "Throughout the past hundred years a number of philosophers and social scientists have asserted the disappearance of the sacred, and predicted the demise of religion. A study of the history of religions shows that religious forms change and that there has never been unanimity on the nature and expression of religion. Whether or not man . . . ' Sexists write and edit religious articles too, of course. 'Whether or not man is now in a new situation for developing structures of ultimate values radically different from those provided in the traditionally affirmed awareness of the sacred is a vital question.'"

"So?"

"So, I think the bureaucratic religions try to institutionalize your perception of the numinous, instead of providing the means so you can perceive the numinous directly -- like looking through a six-inch telescope. If sensing the numinous is at the heart of religion, who's more religious would you say: the people who teach

*Escape Book.
in book?*

the bureaucratic religions, or the people who teach science?"

[Good natured return by Ken to less serious matters.]

All right

She gave him a long, passionate kiss.

5 She was taking herself too seriously again. It was a real danger, considering the problems before her. Ken was ^{often} able to pull her out deftly, with a light touch. She needed him on many different levels now, ^{and} she was a little unsure that she would be able to handle ^{about} her ⁱⁿ many responsibilities without him. The love exhilarated her, and the dependency dismayed her. Love is only for the brave, she thought.

"Let's see if I've got this straight," he returned. ^{and there's} "There's, this couple, lying naked in bed, ^{Saturday} ~~on~~ a lazy afternoon, and they're reading The Encyclopedia Britannica to each other, and arguing ^{about} whether ~~science or religion~~ ^{the} Andromeda ^{galaxy} is more numinous than ^{the} Resurrection. Do they know how to have a good time, or ~~what?~~ don't they?"

Contact: CHAPTER 9

27 September, 1984

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She could recall the exact the moment when, on one of many trips to Washington, she decided that she must be falling in love with DeVries. Arrangements for the meeting with Palmer Joss seemed to be taking forever. Apparently, Joss was reluctant to visit the Argus facility; it was the impiety of the scientists, not their interpretation of the Message, he now said, that interested him. And to probe their character, some more neutral ground was needed. Ellie was willing to go anywhere, and a special assistant to the President was negotiating. Other radio astronomers -- Valerian or Drumlin, say, much less Vaygay -- were not to go. The President wanted it to be Ellie alone. She was also waiting for the day, still some months off, on which she would fly to Paris for the first full meeting of the World Message Consortium. She and Vaygay were coordinating the global data collection program. The signal acquisition was now fairly routine, and there had been, in recent months, not one gap in the coverage. So she found, to her surprise, that she had a little time on her hands. She vowed to have a long talk with her mother, and to remain civil and friendly no matter what provocation was offered. There was an absurd amount of backed-up paper and electronic mail to go through -- not just congratulations and criticism from colleagues, but religious admonitions and fan mail from all over the world. She had not read The Astrophysical Journal in months, although she was the first author on a very recent paper that was surely the

most extraordinary article that had ever appeared in that august publication. There were other meritorious radioastronomy programs -- the quasar survey, for example -- that needed attending to. But instead of doing all these things, she found herself spending increasing time with Ken.

She felt it her duty to involve the President's Science Advisor as deeply as he wished in Project Argus. It was important for the project that the President be fully and competently informed. She hoped the leaders of other nations would be as thoroughly briefed on the findings from Vega as was the President of the United States. This President, while untrained in science, genuinely liked the subject, enjoyed understanding some aspect of nature of which she had previously been ignorant, and was willing to support science not only for its practical benefits but, at least a little, for the joy of knowing. This had been true of few previous American leaders since James Madison and John Quincy Adams.

Still, it was remarkable how much time DeVries was able to spend at Argus. He did, it was true, devote an hour or more each day in high-bandpass scrambled communications with his Office of Science and Technology Policy in the Old Executive Office Building. But the rest of the time, as far as she could see, he was simply . . . around. He would poke into the innards of the computer system, or seemingly randomly selected components of the radio telescope array. Sometimes he would have with him a technician from his office; more often he

would be alone. Occasionally she would see him through the open door of the spare office they had assigned him, his feet propped up on the desk, reading some report prepared for him. He would offer her a cheery wave. She would find him talking casually with Drumlin or Valerian; but equally so with junior technicians, and with the secretarial staff, who had on more than one occasion pronounced him, within Ellie's hearing, "charming."

DeVries had many questions for her as well. At first they were purely technical and programmatic, but then extended rapidly into speculations about and plans for a wide variety of conceivable future events. These days, it almost seemed, discussion of the project was a pretext to spend a little time together.

One fine autumn afternoon in Washington, the President was obliged to delay a meeting of the Special Contingency Task Group because of the Tyrone Free crisis. After an overnight flight from New Mexico, Ellie and DeVries found themselves with an unscheduled few hours, and decided to visit the Viet Nam Memorial. Amidst the sombre and doleful reminders of a foolish war -- by which the United States finally drained an enormous reservoir of global goodwill while killing more than a million people [CHECK] in the process -- DeVries seemed inappropriately cheerful, and Ellie began reluctantly to speculate about flaws in his character.

He had coaxed an exquisite blue caterpillar [APPROPRIATE FOR AUTUMN?] to climb aboard a twig. Briskly, it crawled along the stick, its irridescant body rippling with the motion of fourteen pairs of feet. It reached the end, held on with its last five segments, and flailed in the air in a plucky attempt to find a new perch. Unsuccessful, it turned itself around smartly and retraced its many steps. DeVries then changed his clutch on the twig to the opposite end, so that when the caterpillar returned to its starting point there was again nowhere to go. Like some caged mammalian carnivore, it paced back and forth, eight, nine, ten, eleven times, but in the last few passages, it seemed to her, with increasing resignation. . She was beginning to feel pity for the poor creature, even if it proved to be, say, the larva responsible for the barley blight.

"What a wonderful program in this guy's head! It works every time. Optimum escape software. And the caterpillar never falls off. I mean the twig is effectively suspended in air. The caterpillar never experiences this in nature. The twig is always connected to something. Ellie, did you ever wonder what that program would feel like if it was in your head? I mean, would it just seem obvious to you what you should do when you come to the end of a stick? Would you have the impression that you were thinking it through? Would you ever wonder how you knew to shake your front ten feet in the air, but be sure to hold on tight with the other eighteen?"

She inclined her head slightly and examined him closely. He seemed to experience little difficulty imagining her as a caterpillar. Was he now contemplating some further abuse of invertebrates? She tried to reply noncommittally.

"What'll you do with it now?"

"I'll put it back down in the grass, I guess. What else would you do with it?"

"Some people might kill it."

"It's hard to kill a creature once it lets you see its consciousness. Look around us." He waved at the 30,000 names engraved in the reflecting black granite [CHECK]. "That's why every government that prepares for war paints its adversaries as monsters. They don't want you thinking of the other side as guys who can think and feel."

"Here, look at this creature. Really. Look closely. Watch what it does. _____ is its official name. If it was as big as you or me, it would scare everybody to death. It would be a genuine monster, right? But it's little, eats leaves, minds its own business, and adds a little beauty to the world. Who are the monsters?"

She took the hand not preoccupied with the caterpillar, and they walked wordlessly past the thousands of names inscribed in meticulous alphabetical order. [CARL: THE NAMES ARE NOT ALPHABETICAL; THEY ARE LISTED IN THE CHRONOLOGICAL ORDER OF THE DATES ON WHICH EACH VETERAN DIED. /sja]

* * * *

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"There must be some number," Ellie said, "which measures the total population of intelligent beings in the Milky Way. How many do you suppose it is? If there's a million civilizations, each with

about a billion individuals, that's ten to the fifteenth power intelligent beings. But if most of them are more advanced than we are, maybe the idea of individuals becomes inappropriate; maybe that's just another Earth chauvinism."

"Sure. And then you can calculate the galactic production rate of Gauloises and Twinkies and Volga sedans and Sony pocket communicators. Then we could calculate the gross galactic product. Once we have that in hand we could work on the gross cosmic . . . "

"You're making fun of me," she said with a soft smile, not at all displeased. "But think of such numbers. I mean really think about them. All those planets with all those beings, more advanced than we are. Don't you get a kind of tingle thinking about it? Here, look at this. "

She reached toward the bedside table for Volume 16 of the Encyclopaedia Britannica Macropaedia, titled "Rubens to Somalia," and opened to a page, into which a scrap of computer printout had been inserted as a page marker. She pointed to an article called "Sacred or Holy."

"The theologians seem to have recognized a special, non-rational -- I wouldn't call it irrational -- aspect of the feeling of sacred or holy. They call it 'numinous.' The term was first used by somebody named Rudolph Otto in a 1923 book, The Idea of the Holy. He believed that humans were predisposed to detect and revere the numinous. He called it the misterium tremendum. Even my Latin is

good enough for that. In the presence of the misterium tremendum, people feel utterly insignificant, but, if I read this right, not personally alienated. He thought of the numinous as a thing 'wholly other,' and the human response to it as 'absolute astonishment.' Now, if that's what religious people talk about when they use words like sacred or holy, I'm with them. I felt something like that just in listening for a signal, never mind in actually receiving it. I think all of science elicits that sense of awe.

"Now listen to this." She read from the text. "Throughout the past hundred years a number of philosophers and social scientists have asserted the disappearance of the sacred, and predicted the demise of religion. A study of the history of religions shows that religious forms change and that there has never been unanimity on the nature and expression of religion. Whether or not man . . . ' Sexists write and edit religious articles too, of course. 'Whether or not man is now in a new situation for developing structures of ultimate values radically different from those provided in the traditionally affirmed awareness of the sacred is a vital question.'"

"So?"

"So, I think the bureaucratic religions try to institutionalize your perception of the numinous, instead of providing the means so you can perceive the numinous directly -- like looking through a six-inch telescope. If sensing the numinous is at the heart of religion, who's more religious would you say: the people who teach

the bureaucratic religions, or the people who teach science?"

[Good natured return by Ken to less serious matters.]

She was taking herself too seriously again. It was a real danger considering the problems before her. Ken was able to pull her out deftly, with a light touch. She needed him on many different levels now. She was a little unsure that she would be able to handle her many responsibilities without him. The love exhilarated her and the dependency dismayed her. Love is only for the brave, she thought.

Second draft

Chap. 10 + Sept 27, 1984 version

Special Draft

16 August, 1984

PRECESSION OF THE EQUINOXES

It was odd the way it had worked out. She had imagined that Palmer Joss would come to the Argus facility, watch the signal coming in to the radio telescopes, see the huge room full of magnetic tapes *and disks* on which the previous many months of data had been stored, ask a few scientific questions, and then spend a little time examining the still ~~mostly~~ incomprehensible Message. She hadn't imagined spending ~~a great deal of~~ time discussing philosophy, ^{or} ~~much less~~ theology. But Joss had refused to come to Argus. It wasn't magnetic tape he wanted to scrutinize, he said, it was human character. Peter Valerian would have been ideal for this discussion: unpretentious, able to communicate clearly, and bulwarked by a genuine Christian faith that engaged him daily. But the President had apparently vetoed the idea; she had stressed a small meeting and she had explicitly asked Ellie to ~~help~~ *attend*.

Ellie and ^{Decker} ~~DeVries~~ found themselves in a small library in Orange County, California. ~~Joss had urged that the meeting be held at the Bible Science Research Institute and Museum.~~ *was the setting that Joss had proposed.* Outside the library were a plaster impression from the Red River of dinosaur footprints mixed with those of a man in sandals, proving, so the caption said, that Man and Dinosaur were contemporaneous, ^{aries,} at least in Texas, and therefore *that* evolution was false; *Can't, thought Ellie, that there were shoemakers in the Cretaceous* a conventional Foucault pendulum, demonstrating the rotation of the Earth; ^{adjacent} a vast exhibit called "Darwin's Default";

and a lavish three-meter Matsushita holography unit ^{near} ~~on~~ the podium of a small theatre, from which the most eminent divines could communicate directly to the faithful.

Communicating still more directly to her at this moment was the Reverend Billy Jo Rankin. She had not known until the last moment that Joss had invited Rankin, and she was surprised at the news. ~~She had understood that~~ ^{had been} ~~there was~~ continuous theological disputation between ~~the two of them,~~ ^{Smart T} moderated only by their common concern for a ^{two hours into their discussion,} unified fundamentalist community. ~~But here~~ ^{Rankin} was Rankin, alternately castigating and imploring, while Joss, the faintest of smiles on his face, had his eyes half-closed and his head bowed in what seemed very close to an attitude of prayer. And what ~~he~~ ^{Rankin} had to say, at least so far, seemed to be doctrinally ^{indistinguishable from} ~~very similar to~~ Joss's television address. His suit was immaculate^{ly} tailored, his nails freshly manicured, and his beaming smile stood in some contrast to Joss's rumpled, distracted, and more weatherbeaten appearance.

"You scientists are so shy," he was saying. "You love to hide your light under a bushel basket. You'd never guess what's in those papers from the titles. Einstein's first paper on the theory of Relativity was called 'The Electrodynamics of Moving Bodies.' No $E=mc^2$ up front. No sir. The 'Electrodynamics of Moving Bodies.' I suppose if God appeared to a whole gaggle of scientists, maybe at one of those big Association meetings, they'd write a paper all about it and call it maybe 'On Spontaneous Dendritoform Combustion in Air.'"

1 February, 1985

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✓ Whether an Advent was at hand, whether Doomsday is a necessary accompaniment of Advent and on the role of miracles in the ministry, among other matters. But they had recently effected a widely publicized reconciliation done, it was said, for the common good of the fundamentalist community in America. The signs of reconciliation between the United States and the Soviet Union had, psychologists were now believing, worldwide ramifications in the arbitration of disputes. Holding this meeting here was one of the prices Palmer Joss had to pay for the reconciliation.

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✓ Perhaps Rankin felt the exhibits would provide factual support for his position were there any scientific points in dispute.

1 February, 1985

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There had been a widely publicized reconciliation between the two religious leaders, Palmer Joss and Billy Jo Rankin.



They'd have lots of equations; they'd talk about 'economy of hypothesis'; but they'd never say a word about God.

"Y'see, you scientists are too skeptical." From the sidewise motion of his head, Ellie deduced that ^{Der Heer} ~~DeVries~~ also was included in this assessment, although the remarks seemed to be addressed mainly to her. "You question everything, or try to. You've never heard about 'Leave well enough alone.' You always want to check out if a thing is, what you call, true. And true only means empirical, sense data, things you can see and touch. There's no room for inspiration or revelation in your world. Right from the beginning you rule out of court almost everything that religion is about. I ^{mis} trust the scientists

because the scientists mistrust everything." ^{Despite herself, she thought Rankin had put his case well. And he was supposed to be the dumb one among the modern video evangelists. No, not dumb, she corrected herself.}
~~Over the past half-hour Ellie had bitten her tongue more than~~
 once. Both the White House people and ^{Der Heer} ~~DeVries~~ were recording the discussion and, although both groups had ^{agreed} ~~promised~~ that the

recordings were not for public use, she worried about embarrassing the Project or the President if she spoke her mind. But Rankin's remarks had ~~been~~, in her view, ^{become increasingly} ~~getting progressively~~ more outrageous, and no interventions were being made either by ^{Der Heer} ~~DeVries~~ or by Joss. Indeed, the latter had spoken only half-a-dozen words all morning.

"I suppose you want some sort of reply," she found herself saying. "There isn't ^{an} ~~some sort of~~ 'official' scientific position on this question, and I can't pretend to talk for all scientists or even for the Argus Project. But I can make some comments if you'd like."

* He was the one who considered his parishioners dumb. He could, for all she knew, be very smart indeed. Should she respond at all?

Rankin nodded his head vigorously, smiling encouragement. The seeming harshness of his words did not seem reflected in his body language.

"Also, I want you to understand that I'm not attacking anybody's belief system. In this country people are entitled to any belief system they like, even if it's demonstrably wrong. And many of the things you're saying, and that the Reverend Joss has said (I saw your talk on television a few weeks ago) can't be dismissed instantly. But let me try to explain where I think they're improbable."

So far, she thought, I've been the soul of restraint.

"You're uncomfortable with scientific skepticism. But the reason it developed ^{is} because the world is complicated, it's subtle. Everybody's first idea isn't necessarily right. Also, people are capable of self-deception. All sorts of socially abhorrent doctrines have at one time or another been supported by scientists, well-known scientists, famous ^{brand-name} and respected scientists. Slavery, for example, or the Nazi brand of racism. Scientists make mistakes, theologians make mistakes, everybody makes mistakes. ^{To err is.} It's part of being human. So the way you avoid the mistakes, or at least ^{reduce} ~~lessen~~ the chances ^{that} you'll make one, is to be skeptical. There are no received ^{truths} ~~drugs~~ in the world. ^{I know.} But our experience is that when you let the contending opinions debate, when any skeptic can perform ~~his or her own~~ ^{an} experiment to check some contention out, then the truth tends to emerge. It isn't a perfect approach, but it's the only one that seems to work.

"Now, when I look at religion, I see lots of contending opinions. For example, the Christians think the universe is ~~only~~ a finite number of years old. From some of the exhibits out there, it's clear that some Christians (and Jews, and Muslims) think that the universe is only 6,000 years old. The Hindus, on the other hand, -- and there are a lot of Hindus in the world -- think that the universe is infinitely old, with an infinite number of subsidiary creations and destructions along the way. Now they can't both be right. Either the universe is a certain number of years old or it's infinitely old. Your friends out there ought to debate Hindus. God seems to have told them something different from what He told you.

she gestured out the glass door towards several museum workers ambling past "Darwin's Default"

But you tend only to talk to yourselves."

Maybe a little too strong? she asked herself.

"More generally, the various major religions on the Earth contradict each other in ~~hundreds~~ ^{dozens separate} of respects. You can't all be right. And what if all of you are wrong? It's a possibility, *you know.* ~~Don't~~ *right?* ~~You must~~ *you* care about the truth? Well, the way to winnow through all the different contentions is to be skeptical. I assure you I'm not any more skeptical about your religious beliefs than I am about every new hypothesis in science I hear about. But in my line of work, they're called hypotheses, not inspiration and not revelation."

Joss now stirred a little, but it was Rankin who replied.

"The revelations, the confirmed predictions by God in the Old Testament and the New are legion. The coming of the Saviour is foretold in [PRECISE BIBLICAL REFERENCES]. That he would come from the line of David was foretold in [REFERENCE] . . . "

Even the straightforward prophecies direct from the top you try to weasel out of -- like Jesus' promise that the Kingdom of God would come in the lifetime of some people in his audience. And don't tell me that the Kingdom of God is within me. His audience understood him quite literally.

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"That ought to be an embarrassment for you, not a ~~revelation~~ ^{lineage back} prophecy. All Matthew [CHECK] can do is to trace Joseph's ~~relation~~ to David, not Mary's. Or don't you believe in God the Father?"

Rankin continued smoothly on, not rising to the bait she had offered.

[MORE STANDARD FUNDAMENTALIST REVELATION.]

"And the Bible speaks to our own time. Israel and the Arabs, America and Russia, nuclear war -- it's all there in the Bible.

Anybody with an ounce of sense can see it. You don't have to be some university fancy professor."

^{Your trouble is} "You're exhibiting a failure of the imagination. These ~~supposed~~ prophecies are -- almost every one of them -- vague, ambiguous, imprecise. They admit lots of possible interpretations. You only quote the passages that seem to you to ~~have been~~ fulfilled, and you ignore the rest.

"Imagine that your kind of god -- omnipotent, omniscient, compassionate -- really wanted to leave a record for future generations, to make his existence unmistakable to, say, the remote descendants of Moses. ^{It's} ~~It would have been~~ ^{trivial,} ~~absolutely~~ easy, Just a few enigmatic phrases, ^{and} ~~with some~~ ^{commandment} ~~requirement~~ that they are to be passed on unchanged . . . "

"Joss leaned forward almost imperceptibly. "Such as . . . ?" he asked.

"Such as 'The Sun is a star.' Or 'Mars is a rusty place with deserts and volcanos, like Sinai.' Or, 'A body in motion tends to

remain in motion.' Or -- let's see now -- 'The Earth weighs a million million million million times as much as a child.' Or -- I recognize that both of you seem to have some trouble with special relativity, but it's confirmed every day, routinely, in particle accelerators and cosmic rays -- how about 'There are no privileged frames of reference.'? Or even, 'Thou shalt not travel faster than light.'"

"Any others?" Joss asked.

"Well, there's an indefinite number of them -- ^{on,} at least one for every principle of physics. Let's see . . . 'Heat and light hides in the smallest pebble.' Or even, 'The way of the Earth is as two, but the way of the lodestone is as three.' -- I'm trying to allude to the idea that ~~the~~ gravitational force ~~exerted by the~~ Earth is an inverse square law, ~~compared to the inverse cube force law of a~~ ^{force follows} magnetic dipole. Or in biology . . . -- she nodded towards ~~the~~ ^{while the} attentive but silent DeVries, ^{Der Heer, who seemed to have taken a vow of silence} -- How about 'A double helix is the source of life.'?"

"Now that's an interesting one," said Joss. "You're talking, of course, about DNA. But you know the physician's staff, the symbol of medicine? Army doctors have it on their ^lapels. It's called the caduceus. It shows two serpents intertwined in a perfect double helix. From ancient times that's the symbol of preserving life.

And what about the expression 'this mortal coil.'? Isn't this exactly the kind of connection you're asking about?" ^{But} ~~You might have brought up the phrase, 'this mortal coil.'~~ ^{But} ~~Well,~~ if there are enough symbols and enough prophecies ^{in and} enough myth and folklore, eventually a few of them are going to fit

some current scientific understanding purely by accident. But I can't be sure. Maybe you're right. Maybe the caduceus is a message from God. But, of course, it's not a Christian symbol, or a symbol of any ~~other~~ ^{of the} major religions today. I don't suppose you'd want to argue that the gods talked only to the ancient Greeks. If God wanted to send us a message, and ancient writings was the only way He could think of doing it, He could have done a much better job.

~~"There's another aspect of this that I don't understand at all."~~

"Also, why would you think that ^{chat} He used to be conversing with you believe."

patriarchs and prophets every second Tuesday, He's omnipotent, you say, and omniscient. ^{So} It's no particular effort for Him to remind us

directly, unambiguously, of His wishes at least a few times in every generation. *So, how come, fellas?* Why don't we see Him with crystal clarity?"

"We do." Rankin put enormous feeling in this phrase. "He is all around us. Our prayers are answered. Tens of millions of people in this country have been born again and witnessed God's glorious grace. ~~And~~ ^{The} Bible speaks to us as clearly in this day as it did in the time of Moses and Jesus."

"Oh, come off it. You know what I mean. Where are the burning bushes, the pillars of fire, the great voice that says 'I am that I am' booming down at us out of the sky? Why should God manifest himself in such subtle and debatable ways, when He can make His presence absolutely unambiguous?"

"Joss held her eyes with his own."

"But a voice from the sky is just what you say you found."

"For the first time Joss had entered the discussion. He seemed absolutely. Abraham and Moses, they didn't have radios or telescopes. They

was inclined to continue, but Rankin quickly picked up the thought."

couldn't have heard the Almighty talking by radio. Maybe today God talks to us in new ways, and permits us to have a new understanding. Or maybe it's not God . . . "

"Yes, Satan. I've heard ~~you~~ talk about that ~~possibility~~. ~~Let me~~ ^{Let's} ~~leave~~ ^{one alone for a} ~~let that go by for the moment.~~ ^{You think ^{maybe} the Message is the Voice of God, your God.} Where in your religion does God answer

a prayer by repeating the prayer back?"

^{"I wouldn't call a Nazi newsreel a prayer, myself."}
 "You yourself say it's to attract our attention."

"Then why do you think God has chosen to talk to scientists? Why not preachers like yourself?"

"God talks to me all the time. And the Reverend Joss here. God has told me that a revelation is at hand. When the end of the world is nigh, the rapture will be upon us, the judgment of sinners, the ascension ^{of the elect} to heaven . . . "

"Did ^{he} ~~He~~ tell you ^{he} ~~He~~ was going to make this announcement in the radio spectrum? Is your conversation with God recorded somewhere, so we can verify that it really happened, or do we have only your say-so about it? Why would God choose to announce it to radio astronomers and not to men and women of the cloth? Don't you think it's a little strange that the first message from God in 2,000 years or more is prime numbers ^{...} and Adolf Hitler at the 1936 Olympics? Your God must have quite a sense of humor."

"My God can have any sense He wants to have."

^{Der Heer}
~~DeVries~~ was clearly alarmed at the first appearance of real rancor.

"Uh, let's ^{remind ourselves} ~~talk about~~ what we hope to ^{accomplish} ~~get done~~ at this meeting," he began.

Here's Ken in his mollifying mood, Ellie thought. On some issues he's ~~very~~ courageous, she thought, but chiefly when he has no responsibility for action. ^{He's a brave talker in private. But} On scientific politics, and especially when representing the President, he becomes very accomodating, ready to compromise with the Devil himself. An hour before ^{had} Ken declined an invitation from Rankin to ~~engage on the question of evolution~~. ^{defend evolutionary theory. And he's a biologist.} "We're not here to debate evolution," had been DeVries' response. "We're here," ~~he continued,~~ ^{The reverie had triggered an idea.} "mainly to talk about the signal from Vega, how to interpret it, what insights the religious community might"

"That's another thing," she interrupted. "Excuse me, but I have to point this out. If that signal is from God, why does it come from just one place in the sky -- in the vicinity of a particularly bright, nearby star? Why doesn't it come from all over the sky at once, like the cosmic black-body background radiation? Coming from one star it looks like a signal from another civilization. Coming from everywhere it would look much more like a signal from your God."

"God can make a signal come from the bung hole of the Little Bear, if He wants. ~~Excuse me~~ ^E Excuse me, but you've gotten me riled up. God can do anything."

"Anything you don't understand, you attribute to God. God for you is where you sweep away all the mysteries of the world, all the challenges to our intelligence. You simply turn your mind off and say God did it."

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91 "Ma'am..." Rankin ~~thinks~~ was about to say something, but then thought better of it. He took a deep breath and continued. "This is a Christian

"Ma'am, I didn't come here to be insulted... This is a Christian country and Christians have a position on this issue, a sacred

responsibility to make sure that God's word is understood . . . "

"I'm a Christian and you don't speak for me. You've trapped yourself in some sort of 13th Century religious mania. Since then the Renaissance has happened. The Enlightenment has happened. Where've you been?"

91 Both Arrowway and Rankin, on opposite sides of the table, were half out of their chairs. ~~Both Joss and DerHeer were~~

"Please," ^{Ken} DeVries implored, looking directly at Ellie. "If ~~there we don't~~ keep more to the agenda, isn't more semblance of order, I don't see how we can go on, accomplish what the President asked us to."

"Well, you wanted 'a frank exchange of views.'"

"It's nearly noon," Joss observed. "Why don't we take a little break for lunch?"

Outside the library conference room, leaning on the railing surrounding the Foucault pendulum, Ellie and ^{DerHeer} ~~DeVries~~ had a brief whispered exchange.

"I have more in common with the Vegans... ~~that~~ I'd like to punch out that cocksure, know-it-all, holier than thou... That Rankin makes me want to punch him in the nose."

"Why exactly? Isn't ignorance and error painful enough?"

"Yes, if he'd shut up. ~~But~~ he's corrupting millions."

"Sweetheart, ~~of course you're right. But~~ he thinks the same about you."

* * *

When she and ~~DeVries~~ ^{Der Heer} came back from lunch, Ellie noticed immediately that Rankin appeared subdued, while Joss, who was first to speak, seemed ~~somehow happy~~ ^{cheerful}, certainly beyond ~~bounds~~ ^{the requirements} of mere cordiality.

"Dr. Arroway," he began, "I can understand that you're impatient to show us your findings, and that you didn't come here for theological disputation. But please bear with us ~~a little~~ ^{just a bit} longer. You have a sharp tongue, but you'd make a find backwoods lawyer. [OTHER SIMILE?] I can't recall the last time Brother Rankin got so stirred up on matters of the faith. It must be years."

He glanced momentarily at his colleague who was doodling, apparently idly, on a yellow legal pad, his collar unbuttoned and his necktie drawn a few centimeters down.

"I was struck by one or two things you said this morning. You called yourself a Christian. In what sense are you a Christian?"

"I never guessed that ~~this~~ ^{my religious views} would be part of the job when I accepted the directorship of the (Argus Project)." She said this lightly. "I'm a Christian in the sense that I find Jesus Christ to be an admirable historical figure. I think the Sermon on the Mount is one of the greatest ethical statements, and one of the best speeches in history. I think that "Love your enemy" might even be the longshot

solution to the problem of nuclear war. But I only think that he was a man. A great man, a brave man, a man with insight into ~~the~~ unpopular truths. But I don't think he was God or the son of God or the grandnephew of God. If you want to believe in God, I think there was as much God in him as there is in the rest of us.

"But you don't want to believe in God." He said it as a statement. "So you think you can be a Christian and not believe in God. Let me ask you straight out: Do you believe in God?"

"The question has a peculiar structure. If I say no, do I mean I'm convinced God doesn't exist, or do I mean I'm not convinced he does exist? Those are two very different statements."

"Let's see if they are so different, Dr. Arroway. May I call you 'Doctor'? You believe in Occam's Razor, isn't that right? ~~That~~ If you have two different, equally good explanations of the same experience, pick the simplest. If you have serious doubts about whether there's a God -- enough doubts so you're unwilling to commit yourself to ~~The~~ faith -- then you must be able to imagine a world without God: ~~A~~ a world that comes into being without God, a world that goes about its everyday life without God, a world where people die without God. That would be a world in which we weren't here on Earth for any good reason -- I mean any purpose -- just some ~~very~~ complicated

sequence of atomic collisions. You can tell ~~that~~ I view a world like that with distaste. But if you can imagine that world, why should you ~~be on~~ some middle ground? If you believe all that already, isn't

No, that's too mild. That would be a hateful and inhuman world. I wouldn't want to live in it.

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~~"I thought you were going to argue that God is the simpler hypothesis. But this is a much better point.~~

it ~~a~~ much simpler ~~argument~~ to say that there's no God than to say that there is one? How can a thoroughgoing committed conscientious scientist be an agnostic if you can even imagine a world without God? Wouldn't you ^{just} have to be an atheist?"

If it were ^{just} a simple matter of scientific discussion, I'd agree ~~Do you mind if I call you 'Reverend'?~~ with you, Reverend Joss. Then I would call myself an atheist, because

~~science is essentially concerned with self-correcting hypotheses. If the laws of nature without supernatural intervention, atheism explaining all the available facts right now, and then there's a single stormy that doesn't fit is discarded.~~

~~a new piece of evidence that points the other way, there might be a trend away from atheism, and well past agnosticism.~~

~~But this isn't mainly a scientific issue. We're talking religion and public welfare and politics."~~

some breakdown of the Laws of Nature.

"I've always thought that an agnostic is an atheist without the courage of his convictions."

"You could just as well say that an agnostic is a fundamentalist with at least a rudimentary knowledge of human fallibility. When I say I'm an agnostic, I only mean that the evidence isn't in. There isn't compelling evidence that a God exists -- at least your kind of god -- and there isn't compelling evidence that ^{he} ~~he~~ doesn't. Since more than half the people on the Earth aren't Jews or Christians or Muslims, I'd say that there aren't any compelling arguments for the Old Testament God, ^{Otherwise,} or everybody on Earth would have been converted. ^{again,} And as I was saying this morning, if God wanted to convince us, he could have done a much better job. ^{Flu} Look at how clearly authentic the

Message is. It's being picked up all over the world. Radio
 telescopes ^{are humming away} in countries with different histories, different languages,
 different politics, different religions. ^{at} Everybody's getting the same
 kind of data from the same place in the sky, ^{at} from the same frequencies
 with the same polarization modulation. ^{The Muslims, the Hindus, the Christians and the athiests are getting the same message} Any skeptic can hook up a

radio telescope -- it doesn't have to be very big -- and get the
^{identical} same kind of data.

^{not} "You're suggesting that your radio message is from God?" Rankin
~~asked~~ ^{offered}.

"Not at all. Just that ^{the} ~~that~~ civilization on Vega -- with
 powers infinitely less than what you attribute to your God -- ~~were~~ ^{was}
 able to make things very clear. If your God wanted to talk ^{to} us through
 the unlikely means of word-of-mouth transmission over thousands of
 years, He could have done it so that there was no room left for debate
 about the existence of God."

"And what do you think of the possibility that it's sent by the
 Devil?"

^H "A demonic diversion?"

^I "I don't know why imagining a radio message from the Devil sounds
 crazier to me than imagining a radio message from God. But it does.
 I repeat, I think by far the most likely situation is that there is a
 civilization that has grown up on a planet surrounding the star Vega.
 They're not God, they're not the Devil, they didn't create the Earth
 or the universe, they probably don't look anything like us, and before
 our television signals got to them they never heard of Jesus Christ."

That's what I think. If you ask me could the Message be from God, or could the Message be from the Devil -- assuming that there's anything in nature corresponding to those two words -- I can only say I ~~can't rule it out~~. But there isn't a smidgeon of evidence in favor of ~~such an~~ idea. If it wasn't being seriously considered by two such distinguished religious leaders as you guys, I'd be tempted to call the notion crazy. Why don't we just withhold judgment for a while, until we make some more progress on decrypting the Message? Would you like to see some of the data?"

They assented, readily enough, it seemed. But ~~it was~~ only reams and reams of zeros and ones, neither edifying nor inspirational. She carefully explained about the pagination of the Message and the hoped-for primer. By unspoken agreement, she and ~~Devries~~ said nothing about the Soviet view that the Message was the blueprint for a machine. It was at best a guess, and had not yet been publicly discussed by the Soviets. As an afterthought, she described something about Vega itself -- its mass, surface temperature, color, distance from the Earth, lifetime, and the ring of orbiting debris around it that had been discovered by the infrared astronomy satellite in 1983.

"But beyond it being one of the brightest stars in the sky -- not the brightest -- is there anything special about it?" Joss wanted to know. "Or anything that connects it up with the Earth?"

"Well, in terms of stellar properties, anything like that, I can't think of anything. But there is one incidental fact: Vega was the Pole Star about 12,000 years ago and it will be again about 14,000 years from now."

"I thought the Pole Star was ~~our~~ ^{the} pole star." Rankin was still doodling.

"It is. But not forever. The Earth is like a spinning top. Its axis is slowly precessing in a circle. It's called the precession of the equinoxes."

"Discovered by Hipparchus of _____" added Joss. This seemed a surprising bit of information ^{for him} to have at his fingertips.

"So right now the ~~North Pole~~ ^{Earth's axis} points to Polaris, in the constellation of Little Dipper or Little Bear. ~~that~~ ^{The} you were referring ~~it~~ ^{as I remember, Mr. Rankin} to this morning. But as the Earth's axis slowly precesses, it points ~~in some different direction in the sky~~ ^{away from} than Polaris, and over 26,000 years where the North Pole points in the sky has made a complete circle. Well, just by accident the North Pole points near ~~some~~ ^{right now} star ~~in the~~ ^{this} Little Dipper ~~right now~~ ^{right now}, not directly at it, you understand, but close enough to be useful in navigation. Most of the time, the axis of rotation points to some blank space in the sky between naked-eye stars. ~~But~~ ^{Right now} it points at Polaris and 12,000 years ago it pointed at Vega. But there's no physical connection. How the stars are distributed in the Milky Way has nothing to do with the Earth's axis of ~~of~~ ^f rotation being tipped 23-1/2 degrees."

"Now 12,000 years ago is 10,000 B.C., the time when civilization was just starting up. Isn't that right?" Joss asked.

"Unless you believe that the Earth was created in 4004 B.C."

"No, we don't believe that, do we, Brother Rankin? We just don't think the age of the Earth is known with the same precision that you scientists do. We're what you might call agnostics on the age of the Earth." He had a most attractive smile. "So if anybody was navigating 10,000 years ago, sailing the Mediterranean, say, or the Persian Gulf, Vega would have been their guide?"

"Absolutely. It must have seemed an amazing gift -- providential, if you like -- that such a bright star was exactly to the North. I'll bet a lot of people owed their lives to that coincidence."

"Well now, that's mighty interesting."

"I don't want you to think I used the word 'providential' as anything but a metaphor."

"I'd never think ^{+ hot,} ~~of it,~~ my dear."

Joss was by now giving signs that the afternoon was drawing to a close. But there were a few items still, it seemed, on Rankin's agenda.

"It amazes me that you think that it wasn't divine providence, Vega being the Pole Star. My faith is so strong I don't need proofs, but every time a new fact comes along it simply confirms my faith."

"Well then I guess you weren't listening very closely to what I was saying this morning. I resent the idea that we're in some kind of

faith contest, and you're the hands-down winner. So far as I know you've never tested your faith. You talk a lot, but are you willing to put your life on the line for your faith? I'm willing to do it for my faith. Here, take a look out that glass. There's a big Foucault pendulum out there. The bob must weigh 50 pounds. My faith says that the amplitude of a pendulum -- the amount of the excursion from vertical position -- can never increase, ^{It can} ~~but~~ only decrease. I'm willing to go out there, put the bob in front of my nose, let go, have it swing to the other side and then back to me. If my faith is wrong I'll get a 50-pound pendulum bob in the face. Come on. You wanna test me out?"

"Truly, it's not necessary. ^{We} ~~I~~ believe you," replied Joss.

"But would you be willing to stand a foot closer to this same pendulum and pray God to shorten the swing? What if it turns out that you've gotten it all wrong, that what you're teaching isn't God's will at all? How can you be really sure?"

^{incidentally,} "And, if you really are so sure of the truth of your doctrine, why insist on indoctrinating infants? Give your supplicants a fighting chance. Try convincing them after they've had a little experience with the varieties of nonsense in the world. But you guys insist on baptism and first communion and Sunday School and all the rest of it. You teach your doctrine to small children, and down the street there's some other church with some other bizarre belief that's busy propagandizing its children. And when all these helpless

~~parishioners~~ ^{kids} finally grow up, what chance do they have to ^{recognize} ~~find~~ the truth? You've tied community feeling, and parental approval, and a beginning appreciation for music and art and literature to the doctrines of your sect. Of course it's hard to shake it off after you're all grown up.

"Look, we all have a thirst for wonder. It's a deeply human quality. Science and religion are both bound up with it. What I'm saying is you don't have to make stories up, you don't have to exaggerate. There's wonder and awe enough in the real world. And it's more subtle, more intricate. Nature's a lot better at inventing wonders than we are."

"We are all wayfarers on the road to truth," ^{Rankin said, folding his doodles and carefully inserting them in ^{inside breast} his pocket.}
~~"Yeah, but some of us are walking, and others are dragging their heels."~~

Both Joss and ^{DeVries} ~~DeVries~~ stepped in deftly, and amidst ~~pleasant~~ ^{strained} civilities they ^{all} prepared to leave. She wondered whether anything useful had been accomplished. Valerian would have been much more effective, much less provocative. She wished she had ^{kept} ~~restrained~~ herself ^{in check.} better.

"It's been a most interesting day, Dr. Arroway, and I thank you for it." Joss seemed a little remote again, distracted. But he shook her hand warmly on the way out to the waiting government car, past a lavishly rendered three-dimensional exhibit on "The Fallacy of the Expanding Universe." She whispered to DeVries:

A sign read, "Our God Is Alive and Well. Sorry About Yours."

16 August, 1984

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"I'm sorry if I ~~let you down.~~ *made your job more difficult.*"
"Oh no, Ellie. You were ~~fantastic~~ *fine.*" ✓

"That Palmer Joss is a very attractive man. I don't think I did much to convert him. But, I'll tell you, he almost converted me."

Carl

Contact: CHAPTER 10

St. John's Library

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27 September, 1984

It was odd the way it had worked out. She had imagined that Palmer Joss would come to the Argus facility, watch the signal being gathered in by the radio telescopes, note the huge room full of magnetic tapes on which the previous many months of data were stored, ask a few scientific questions, and then examine, in its multiplicity of zeros and ones, some of the reams of computer printout displaying the still incomprehensible Message. She hadn't imagined spending hours arguing philosophy, much less theology. But Joss had refused to come to Argus. It wasn't magnetic tape he wanted to scrutinize, he said, it was human character. Peter Valerian would have been ideal for this discussion: unpretentious, able to communicate clearly, and bulwarked by a genuine Christian faith that engaged his everyday life. But the President had apparently vetoed the idea; she had urged a small meeting, and, according to DeVries, had explicitly asked for Ellie to attend.

Joss had insisted that the discussion be held here, at the Bible Science Research Institute and Museum in Orange County, California. She glanced past DeVries, out the glass partition that separated the library from the exhibit area. Just outside was a plaster impression from a Red River sandstone of dinosaur footprints interspersed with those of a pedestrian in sandals, proving, so the caption said, that Man and Dinosaur were contemporaries, at least in Texas. Shoemakers

in the Mesozoic seemed also to be implied. The conclusion drawn in the caption was that evolution was a fraud. The opinion of most paleontologists -- that the sandstone was a fraud -- remained, Ellie had noted two hours earlier, unmentioned. The intermingled footprints were part of a vast exhibit called "Darwin's Default." To its left was a Foucault pendulum, demonstrating the scientific assertion, this one apparently uncontested, that the Earth turns. To its right, Ellie could see part of a lavish three-meter Matsushita holography unit on the podium of a small theatre, from which the most eminent divines could communicate directly to the faithful.

Communicating still more directly to her for most of the morning, was the Reverend Billy Jo Rankin. She had not known until the last moment that Joss had invited Rankin, and was surprised at the news. She had understood there to be continuous theological disputation between them, moderated only by their common concern for a unified fundamentalist community. But here was Rankin, alternately castigating and imploring, his suit immaculately tailored, his nails freshly manicured, and his beaming smile standing in some contrast to Joss's rumpled, distracted, and more weatherbeaten appearance. Joss, the faintest of smiles on his face, had his eyes half-closed and his head bowed in what seemed very close to an attitude of prayer. He roused himself now.

"You scientists are so shy," he was saying. "You love to hide your light under a bushel basket. You'd never guess what's in those

papers from the titles. Einstein's first work on the Theory of Relativity was called 'The Electrodynamics of Moving Bodies.' No $E=mc^2$ up front. No sir. 'The Electrodynamics of Moving Bodies.' I suppose if God appeared to a whole gaggle of scientists, maybe at one of those big Association meetings, they'd write something all about it and call it, maybe, 'On Spontaneous Dendritoform Combustion in Air.' They'd have lots of equations; they'd talk about 'economy of hypothesis'; but they'd never say a word about God.

"Y'see, you scientists are too skeptical." From the sidewise motion of his head, Ellie deduced that DeVries was also included in this assessment, although the remarks seemed to be addressed mainly to her. "You question everything, or try to. You've never heard about 'Leave well enough alone.' You always want to check out if a thing is what you call 'true'. And 'true' only means empirical, sense data, things you can see and touch. There's no room for inspiration or revelation in your world. Right from the beginning you rule out of court almost everything religion is about. I mistrust the scientists because the scientists mistrust everything."

Over the past half-hour Ellie had bitten her tongue more than once. Both the local fundamentalists and an aide to DeVries were recording the discussion and, although both groups had promised that the recordings were not for public use, she worried about embarrassing the Project or the President if she spoke her mind. But Rankin's remarks had been, in her view, getting progressively more outrageous,

and now Joss, who had spoken only a half-dozen words all morning, was beginning to gird for battle. DeVries remained amiably silent.

"I suppose you want a reply," she found herself saying. "There isn't some sort of 'official' scientific position on all these questions, and I can't pretend to talk for all scientists or even for the Argus Project. But I can make some comments if you'd like."

Rankin nodded his head vigorously, smiling encouragement. Languidly, Moss merely waited.

"I want you to understand that I'm not attacking anybody's belief system. As far as I'm concerned, you're entitled to any belief system you like, even if it's demonstrably wrong. And many of the things you're saying, and that the Reverend Joss has said (I saw your talk on television a few weeks ago) can't be dismissed instantly. It takes a little work. But let me try to explain where I think they're improbable.

"You're uncomfortable with scientific skepticism. But the reason it developed is that the world is complicated. It's subtle. Everybody's first idea isn't necessarily right. Also, people are capable of self-deception. All sorts of socially abhorrent doctrines have at one time or another been supported by scientists, well-known scientists, famous and respected scientists. Slavery, for example, or the Nazi brand of racism. Scientists make mistakes, theologians make mistakes, everybody makes mistakes. It's part of being human. So the way you avoid the mistakes, or at least lessen the chances that you'll

make one, is to be skeptical. You test the ideas. You check them out by rigorous standards of evidence. I don't think there is such a thing as a received truth. But when you let the different opinions debate, when any skeptic can perform his or her own experiment to check some contention out, then the truth tends to emerge. That's the experience of the whole history of science. It isn't a perfect approach, but it's the only one that seems to work.

"Now, when I look at religion, I see lots of contending opinions. For example, the Christians think the universe is only a finite number of years old. From the exhibits out there it's clear that some Christians (and Jews, and Muslims) think that the universe is only 6,000 years old. The Hindus, on the other hand -- and there are lots of Hindus in the world -- think that the universe is infinitely old with an infinite number of subsidiary creations and destructions along the way. Now they can't both be right. Either the universe is a certain number of years old or it's infinitely old. Your friends out there ought to debate Hindus. God seems to have told them something different from what He told you. But you tend to talk only to yourselves.

"More generally, the various major religions on the Earth contradict each other in hundreds of respects. You can't all be right. And what if all of you are wrong? It's a possibility. Don't you care about the truth? Well, the way to winnow through all the differing contentions is to be skeptical. I'm not any more skeptical

about your religious beliefs than I am about every new scientific idea I hear about. But in my line of work they're called hypotheses, not inspiration and not revelation."

Joss now stirred a little, but it was Rankin who replied.

"The revelations, the confirmed predictions by God in the Old Testament and the New are legion. The coming of the Saviour is foretold in [PRECISE BIBLICAL REFERENCES]. That he would come from the line of David was foretold in [REFERENCE] . . . "

"That ought to be an embarrassment for you, not a revelation. All Matthew [CHECK] can do is to trace Joseph's relation to David, not Mary's. Or don't you believe in God the Father?"

Rankin continued smoothly on, not rising to the bait she had offered.

[MORE STANDARD FUNDAMENTALIST REVELATION.]

"And the Bible speaks to our own time. Israel and the Arabs, America and Russia, nuclear war -- it's all there in the Bible. Anybody with an ounce of sense can see it. You don't have to be some fancy professor."

"You're exhibiting a failure of the imagination. These supposed prophecies are -- almost every one of them -- vague, ambiguous, imprecise. They admit lots of possible interpretations. You only quote the passages that seem to you to have been fulfilled, and you ignore the rest.

"But imagine that your kind of god -- omnipotent, omniscient, compassionate -- really wanted to leave a record for future generations, to make his existence unmistakable to, say, the remote descendants of Moses. It would have been perfectly easy. Just a few enigmatic phrases, with some requirement that they are to be passed on unchanged . . . "

Joss leaned forward almost imperceptibly. "Such as . . . ?" he asked.

"Such as 'The Sun is a star.' Or 'Mars is a rusty place with deserts and volcanos, like Sinai.' Or, 'A body in motion tends to remain in motion.' Or -- let's see now --" (she quickly scribbled some numbers on a pad) "'The Earth weighs a million million million million times as much as a child.' Or -- I recognize that both of you seem to have some trouble with special relativity, but it's confirmed every day, routinely, in particle accelerators and cosmic rays -- how about 'There are no privileged frames of reference.'? Or even, 'Thou shalt not travel faster than light.'"

"Any others?" Joss asked.

"Well, there's an indefinite number of them -- at least one for every principle of physics. Let's see . . . 'Heat and light hide in the smallest pebble.' Or even, 'The way of the Earth is as two but the way of the lodestone is as three.' -- I'm trying to suggest that the gravitational force follows an inverse square law, while a

magnetic dipole follows an inverse cube force law. Or in biology . . ."

-- she nodded towards the attentive but silent DeVries -- "How about 'A double helix is the basis of life.'?"

"Now that's an interesting one," said Joss. "You're talking, of course, about DNA. But you know the physician's staff, the symbol of medicine? Army doctors have it on their labels. It's called the caduceus. It shows two serpents intertwined. It's a perfect double helix. From ancient times that's been the symbol of preserving life. Isn't this just the kind of connection you're suggesting?"

"Well, if there are enough symbols and enough prophecies in enough myth and folklore, eventually a few of them are going to fit some current scientific understanding purely by accident. But I can't be sure. Maybe you're right. Maybe the caduceus is a message from God. But, of course, it's not a Christian symbol or a symbol of any other major religion today. I don't suppose you'd want to argue that the gods talked only to the ancient Greeks. What I'm saying is: If God wanted to send us a message, and ancient writings was the only way He could think of doing it, He could have done a much better job. And He hardly had to confine Himself to writings. Why isn't there a monster crucifix orbiting the Earth? Why isn't the surface of the Moon covered with the Ten Commandments? Why should He be so clear in the Bible and so obscure in the world?"

Joss had apparently been ready to reply a few sentences back, a look of genuine pleasure unexpectedly on his face, but Ellie's rush of words was gathering momentum, and perhaps he felt it impolite to interrupt.

"There's another aspect of your position that I don't understand at all. Why do you think God abandoned us? And when did it happen? He used to be conversing with patriarchs and prophets every second Tuesday. He's omnipotent, you say, and omniscient. It's no particular effort for Him to remind us directly, unambiguously, of His wishes at least a few times in every generation. Why don't we see Him with absolute clarity?"

"We do." Rankin put enormous feeling in this phrase. "He is all around us. Our prayers are answered. Tens of millions of people in this country have been born again and witnessed God's glorious grace. The Bible speaks to us as clearly in this day as it did in the time of Moses and Jesus."

"Oh, come off it. You know what I mean. Where are the burning bushes the Reverend Joss alluded to, the pillars of fire, the great voice that says 'I am that I am' booming down at us out of the sky? Why should God manifest himself in such subtle and debatable ways, when He can make His presence completely unambiguous?"

"But a voice from the sky is just what you say you found." Ellie had paused for breath and Joss had made this comment casually.

"Abraham and Moses, they didn't have radios or telescopes. They couldn't have heard the Almighty talking by radio. Maybe today God talks to us in new ways, and permits us to have a new understanding. Or maybe it's not God . . . "

"Yes, Satan. I heard you talk about that. It sounds absolutely daft. But let's go on. Where in your religion does God answer a prayer by repeating the prayer back?"

"You yourself say it's to attract our attention."

"Then why do you think God has chosen to talk to scientists? Why not preachers like yourself?"

"God talks to me all the time." Rankin's index finger audibly thumped his sternum. "And the Reverend Joss here. God has told me that a revelation is at hand. When the end of the world is nigh, the rapture will be upon us, the judgment of sinners, the ascension to heaven . . . "

"Did He tell you He was going to make that announcement in the radio spectrum? Is your conversation with God recorded somewhere, so we can verify that it really happened? Or do we have only your say-so about it? Why would God choose to announce it to radio astronomers and not to men and women of the cloth? Don't you think it's a little strange that the first message from God in 2,000 years or more is prime numbers and Adolf Hitler at the 1936 Olympics? Your God must have quite a sense of humor."

"My God can have any sense He wants to have."

DeVries was clearly alarmed at the first appearance of real rancor.

"Uh, let's talk about what we hope to get done at this meeting," he began.

Here's Ken in his mollifying mood, Ellie thought. On some issues he's very courageous, she thought, but chiefly when he has no responsibility for action. On scientific politics, and especially when representing the President, he becomes very accomodating, ready to compromise with the Devil himself. She caught herself: the theological language was beginning to get to her. An hour before, Ken had declined an invitation from Rankin to debate on the question of evolution. "We're not here to debate evolution," had been his response. "We're here," he had continued, "to talk about the signal from Vega, how to interpret it, what insights the religious community might . . . "

"That's another thing." She interrupted her own train of thought as well as DeVries. "Excuse me, but I have to point this out. If that signal is from God, why does it come from just one place in the sky -- in the vicinity of a particularly bright nearby star? Why doesn't it come from all over the sky at once, like the cosmic black-body background radiation? Coming from one star it looks like a signal from another civilization. Coming from everywhere it would look much more like a signal from your God."

"God can make a signal come from the bung hole of the Little Bear if He wants. Excuse me, but you've gotten me riled up. God can do anything."

"Anything you don't understand, Mr. Rankin, you attribute to God. God for you is where you sweep away all the mysteries of the world, all the challenges to our intelligence. You simply turn your mind off and say God did it."

"Ma'am, I didn't come here to be insulted. This is a Christian country and Christians have true knowledge on this issue, a sacred responsibility to make sure that God's sacred word is understood . . . "

"I'm a Christian and you don't speak for me. You've trapped yourself in some sort of 13th Century religious mania. Since then the Renaissance has happened. The Enlightenment has happened. Where've you been?"

Both Arroway and Rankin, on opposite sides of the table, were half out of their chairs.

"Please," DeVries implored, looking directly at Ellie. "If there isn't more semblance of order, I don't see how we can go on."

"Well, you wanted 'a frank exchange of views.'"

"It's nearly noon," Joss observed. "Why don't we take a little break for lunch?"

Outside the library conference room, leaning on the railing surrounding the Foucault pendulum, Ellie and DeVries had a brief whispered exchange.

"I'd like to punch out that cocksure, know-it-all, holier than thou . . . "

"Why exactly? Isn't ignorance and error painful enough?"

"Yes, if he'd shut up. But he's corrupting millions."

"Sweetheart, he thinks the same about you."

* * *

When she and DeVries came back from lunch Ellie noticed immediately that Rankin appeared subdued, while Joss, who was first to speak, seemed somehow happy, certainly beyond the demands of mere cordiality.

"Dr. Arroway," he began, "I can understand that you're impatient to show us your findings and that you didn't come here for theological disputation. But please bear with us a little longer. You have a

sharp tongue, but you'd make a fine backwoods lawyer. [OTHER SIMILE?]
I can't recall the last time Brother Rankin here got so stirred up on matters of the faith. It must be years."

He glanced momentarily at his colleague who was doodling, apparently idly, on a yellow legal pad, his collar unbuttoned and his necktie drawn a few centimeters down.

"I was struck by one or two things you said this morning. You called yourself a Christian. May I ask? In what sense are you a Christian?

"You know, this wasn't in the job description when I accepted the directorship of the Argus Project." She said this lightly. "I'm a Christian in the sense that I find Jesus Christ to be an admirable historical figure. I think the Sermon on the Mount is one of the greatest ethical statements and one of the best speeches in history. I think that 'Love your enemy' might even be the longshot solution to the problem of nuclear war. But I think that he was only a man. A great man, a brave man, a man with insight into unpopular truths. But I don't think he was God or the son of God or the grandnephew of God. If you want to believe in God, I think there was as much God in him as there is in the rest of us."

"But you don't want to believe in God." He said it as a simple statement. "You figure you can be a Christian and not believe in God. Let me ask you straight out: Do you believe in God?"

"The question has a peculiar structure. If I say no, do I mean I'm convinced God doesn't exist, or do I mean I'm not convinced he does exist? Those are two very different statements."

"Let's see if they are so different, Dr. Arroway. May I call you Doctor? You believe in Occam's Razor, isn't that right? That if you have two different, equally good explanations of the same experience, you pick the simplest. It works fine, you say. The whole history of science supports it, you say. Now, if you have serious doubts about whether there is a God -- enough doubts so you're unwilling to commit yourself to the faith -- then you must be able to imagine a world without God. A world that comes into being without God, a world that goes about its everyday life without God, a world where people die without God. No punishment. No reward. All the saints and prophets, all the faithful who have ever lived -- why you'd have to believe they were foolish, deceived themselves, you'd probably say. That would be a world in which we weren't here on Earth for any good reason -- I mean any purpose. It would all be just some very complicated series of collisions of atoms, including the atoms that are inside human beings. You can tell I view a world like that with distaste. But if you can imagine that world, why straddle? Why occupy some middle ground? If you believe all that already, isn't it a much simpler argument to say there's no God? You're not being true to Occam's Razor. I think you're waffling. How can a thoroughgoing

committed conscientious scientist be an agnostic if you can even imagine a world without God? Wouldn't you have to be an atheist?"

"If it were just a simple scientific discussion, I think I'd agree with you, Reverend Joss. Then, for the time being at least, I'd call myself an atheist, because science is essentially concerned with examining and correcting hypotheses. If atheism explains all the available facts right now, but tomorrow there's a new piece of evidence that points the other way, then I might change my mind. But this isn't mainly a scientific issue. We're talking religion and public welfare and politics. You don't talk about God as a hypothesis that you happen to find congenial or helpful. You think you've cornered the truth. So I have to point out that you may have missed a thing or two. But if you ask I'm happy to tell you: I can't be sure."

"I've always thought that an agnostic is an atheist without the courage of his convictions."

"You could just as well say that an agnostic is a fundamentalist with at least a rudimentary knowledge of human fallibility. When I say I'm an agnostic, I only mean that the evidence isn't in. There isn't compelling evidence that God exists -- at least your kind of god -- and there isn't compelling evidence that He doesn't. Since more than half the people on the Earth aren't Jews or Christians or Muslims, I'd say that there aren't any compelling arguments for your Old Testament God; otherwise, everybody on Earth would have been

converted. And as I was saying this morning, if God wanted to convince us He could have done a much better job. Look at how clearly authentic the Message is. It's being picked up all over the world. Radio telescopes in countries with different histories, different languages, different politics, different religions, and everybody's getting the same kind of data from the same place in the sky, from the same frequencies with the same polarization modulation. Any skeptic can hook up a radio telescope -- it doesn't have to be very big -- and get the same kind of data.

"You're suggesting that your radio message is from God?" Rankin asked.

"Not at all. Just that the civilization on Vega -- with powers infinitely less than what you attribute to your God -- were able to make things very clear. If your God wanted to talk to us through the unlikely means of word-of-mouth transmission and ancient writings, He could have done it so that there was no room left for debate about the existence of God."

"And what do you think of the possibility that it's sent by the Devil?"

"I don't know why imagining a radio message from the Devil sounds crazier to me than imagining a radio message from God. But it does. I repeat, I think by far the most likely situation is that there is a civilization that has grown up on a planet surrounding the star Vega.

They're not God, they're not the Devil, they didn't create the Earth or the universe, they probably don't look anything like us, and before our television signals got to them they probably never heard of Jesus Christ. Or any of the other thousands of gods that humans have invented. That's what I think. If you ask me, could the Message be from God or could the Message be from the Devil -- assuming that there's anything in nature corresponding to those two words -- I can only say I can't rule those possibilities out. But there isn't a smidgeon of evidence in favor of such an idea. If it wasn't being seriously considered by such distinguished religious leaders as you guys, I'd be tempted to call either notion totally crazy. Why don't we just withhold judgment for a while, until we make some more progress on decrypting the Message? Would you like to see some data?"

This time they assented, readily enough it seemed. But all she had to offer was reams of zeros and ones, neither edifying nor inspirational. She carefully explained about the pagination of the Message and the hoped-for primer. By unspoken agreement she and DeVries said nothing about the Soviet view that the Message was a blueprint for a machine. It was at best a guess, and had not yet been publicly discussed by the Soviets. As an afterthought she described something about Vega itself -- its mass, surface temperature, color, distance from the Earth, lifetime, and the ring of orbiting debris around it that had been discovered by the Infrared Astronomy Satellite in 1983.

"But beyond it being one of the brightest stars in the sky -- not the brightest -- is there anything special about it?" Joss wanted to know. "Or anything that connects it up with the Earth?"

"Well, in terms of stellar properties, anything like that, I can't think of a thing. But there is one incidental fact: Vega was the Pole Star about 12,000 years ago, and it will be again about 14,000 years from now.

"I thought the Pole Star was our pole star." Rankin, still doodling, said this to the pad of paper.

"It is, for a few thousand years. But not forever. The Earth is like a spinning top. Its axis is slowly precessing in a circle. It's called the precession of the equinoxes."

"Discovered by Hipparchus of Rhodes" added Joss. "Second Century, B.C." This seemed a surprising piece of information for him to have at his fingertips.

"So right now," she continued, "an arrow from the center of the Earth to the North Pole points to the star we call Polaris, in the constellation of the Little Dipper or the Little Bear. I think you were referring to this constellation just before lunch, Mr. Rankin. As the Earth's axis slowly precesses, it points in some different direction in the sky, not towards Polaris, and over 26,000 years the place in the sky to which the North Pole points makes a complete circle. The North Pole points right now very near Polaris -- not directly at it, you understand, but close enough to be useful in

navigation. Most of the time, the axis of rotation points to some blank space in the sky between the naked eye stars. Today it points to Polaris and 12,000 years ago it pointed at Vega. But there's no physical connection. How the stars are distributed in the Milky Way has nothing to do with the Earth's axis or rotation being tipped 23-1/2 degrees."

"Now 12,000 years ago is 10,000 B.C., the time when civilization was just starting up. Isn't that right?" Joss asked.

"Unless you believe that the Earth was created in 4004 B.C."

"No, we don't believe that, do we, Brother Rankin? We just don't think the age of the Earth is known with the same precision that you scientists do. On the question of the age of the Earth, we're what you might call agnostics." He had a most attractive smile. "So if anybody was navigating 10,000 years ago, sailing the Mediterranean, say, or the Persian Gulf, Vega would have been their guide?"

"Absolutely. It must have seemed an amazing gift -- providential, if you like -- that such a bright star was exactly to the North. I'll bet a lot of people -- sailors, tradesmen, emigres -- owed their lives to that coincidence."

"Well now, that's mighty interesting."

"I don't want you to think I used the word providential as anything but a metaphor."

"I'd never think it of you, my dear."

Joss was by now giving signs that the afternoon was drawing to a close. But there were still a few items, it seemed, on Rankin's agenda.

"It amazes me that you think that it wasn't divine providence, Vega being the Pole Star. My faith is so strong I don't need proofs, but every time a new fact comes along it simply confirms my faith."

"Well then I guess you weren't listening very closely to what I was saying this morning. I resent the idea that we're in some kind of faith contest and you're the hands-down winner. So far as I know you've never tested your faith. You talk a lot, but are you willing to put your life on the line for your faith? I'm willing to do it for mine. Here, take a look out that window. There's a big Foucault pendulum out there. The bob must weigh 50 pounds. My faith says that the amplitude of a free pendulum -- how far it'll swing away from the vertical position -- can never increase, but only decrease. I'm willing to go out there, put the bob in front of my nose, let go, have it swing away and then back towards me. If my beliefs are in error, I'll get a 50-pound pendulum bob in the face. Come on. You want to test my faith?"

"Truly, it's not necessary. I believe you," replied Joss. Rankin, though, seemed interested.

"But would you be willing to stand a foot closer to this same pendulum and pray to God to shorten the swing? What if it turns out that you've gotten it all wrong, that what you're teaching isn't God's

will at all? Maybe it's the work of the Devil. Maybe it's pure human invention. How can you be really sure?

"And if you really are so sure of the truth of your doctrine, why do you insist on indoctrinating infants? Give your supplicants a fighting chance. Try convincing them after they've had a little experience with the varieties of nonsense in the world. But you guys insist on baptism and first communion and Sunday School and all the rest of it. You teach your doctrine to small children, and down the street there's some other church with some other bizarre belief system that's busy propagandizing its children. And when all these helpless parishioners finally grow up, what chance do they have to discover the truth? You've tied community feeling and parental approval and a beginning appreciation for music and art and literature to the doctrines of your sect. Of course it's hard to shake it off after you're all grown up.

"Look, we all have a thirst for wonder. It's a deeply human quality. Science and religion are both bound up with it. What I'm saying is you don't have to make stories up, you don't have to exaggerate. There's wonder and awe enough in the real world. Much more, in fact. Nature's a lot better at inventing wonders than we are."

"We are all wayfarers on the road to truth. Rankin seemed a little chastened by her outburst.

"Yeah, but some of us are walking, and some others are dragging their heels."

Both Joss and DeVries stepped in deftly, the prospect of blood on the Foucault Pendulum now providentially past, and amidst pleasant civilities they prepared to leave. She wondered whether anything useful had been accomplished. Valerian would have been much more effective, much less provocative. She wished she had restrained herself better. The Foucault Pendulum challenge now seemed especially childish.

"It's been a most interesting day, Dr. Arroway, and I thank you for it." Joss seemed a little remote again, courtly but distracted. But he shook her hand warmly. On the way out to the waiting government car, past a lavishly rendered three-dimensional exhibit on "The Fallacy of the Expanding Universe," she whispered to DeVries:

"I'm sorry if I let you down."

"Oh no, Ellie. You were fantastic."

"That Palmer Joss is a very attractive man. I don't think I did much to convert him. But I'll tell you, he almost converted me."

Chap. 11

THE WORLD MESSAGE
CONSORTIUM~~27 September, 1984~~

From their table by the window she could see the downpour spattering the street outside. A soaked pedestrian, his collar up, gamely hurried by. The proprietor had carefully cranked the striped awning over the tubs of oysters, ~~carefully~~ segregated according to size and quality and providing a kind of street advertisement for the specialty of the house. She felt warm and snug inside the restaurant, the famous theatrical establishment, Chez Dieux; fair weather had been predicted, and she was without ~~a~~ raincoat or umbrella. Likewise unencumbered, Vaygay introduced a new subject:

"My friend, Meera," he announced, "is an ecydesiast -- that is the right word, yes? When she works in your country, she performs for groups of professionals, at meetings and conventions. Meera says that when she takes off her clothes for working class men -- at trade union conventions, that sort of thing -- they become wild, shout out improper suggestions, and try to join her on the stage. But when she gives exactly the same performance for doctors or lawyers, they sit there ~~almost~~ motionless. Actually, she says some of them lick their lips. My question is, are the lawyers ~~more relaxed~~ ^{healthier} than the steelworkers?"

That Vaygay had diverse female acquaintances ~~was not~~ ^{had always been} apparent. His approaches to women were ~~always~~ so direct and extravagant --

herself, for some reason that both pleased and annoyed her, excluded -- that they could always say no without embarrassment. Many said yes. But Meera was a little unexpected.

They had spent the morning in a last-minute comparison of notes and interpretations on the new data. The continuing message transmission had reached an important new stage: Diagrams were being transmitted from Vega. Each was an array raster, the number of tiny dots that made up the picture being the product of two prime numbers. There was a large set of ^{such diagrams,} ~~them~~, one following the other, and not at all interleaved with the text. It was ~~a little~~ like a section of glossy illustrations inserted in a book. After the long sequence of diagrams, the unintelligible text continued. From at least some of the diagrams it seemed obvious that Vaygay and ^{Arkhangelsky} ~~A~~ had been right and that the Message was at least in part the instructions, the blueprints, for building a machine of unknown purpose. At the plenary session of the World Message Consortium, to be held tomorrow at the Elysee Palace, she and Vaygay would present for the first time some of the details to representatives of the other Consortium nations.

Over lunch, she had summarized her encounter with Rankin and Joss. Vaygay had been attentive, but asked no questions. It was as if she had been confessing some unseemly personal predeliction, and perhaps that had triggered ^{previous} his train of association. ~~his~~

"You have a friend named Meera who's a striptease artist? With international venue? "

"Ever since Wolfgang Pauli invented the Exclusion Principle while watching the Folies Bergeres, I have felt it my professional duty as a physicist to visit Paris as much as possible. Somehow I can never convince the officials in my country to offer trips solely for this purpose. Usually, I must do some pedestrian physics as well. But in such establishments -- that's where I met Meera -- I am a student of nature, waiting for insight to strike. Meera says American professional men are sexually repressed and have gnawing doubts and guilt."

"Really. And what does Meera say about Russian professional men?"

"Ah, in that category she knows only me. So, of course, she has a good opinion. I think I'd rather be at Meera's tomorrow. "

"What's worrying you, Vaygay?"

He took a long time before answering, and began with a slight but uncharacteristic hesitation. "Perhaps not worries. Maybe only concerns. . . What if the Message really is the design drawings of a machine? Do we build the machine? Who builds it? Everybody together? The Consortium? The United Nations? A few nations in competition? What if it's enormously expensive to build? What if it doesn't work? Who pays? Could building the machine injure ~~the~~

Why should they want to?

Without pausing in this torrent of questions, Lunacharsky emptied the last of the wine into their glasses.

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economically? Could it injure them some other way?

~~economy~~ of some nations? Even if the Message cycles back and even if we completely decrypt the Message, how good could the translation be? You know the opinion of ^{Cervantes?} ~~Don Quixote?~~ He said that reading a translation is like examining the back of a piece of tapestry. Maybe it's not possible to translate the message perfectly. ~~And~~ then we wouldn't build the machine perfectly. Also, are we really confident we have all the data? Maybe there's essential information at some other frequency that we haven't discovered yet.

"You know, Ellie, I thought people would be very cautious about building this machine. But there may be ^{some} ~~nations~~ coming tomorrow who will urge immediate construction -- ^{I mean} ~~that is~~, immediately after we receive the primer and decrypt the Message, assuming that we do. What is the American delegation going to propose?"

"I don't know," she said ^{slowly} ~~curiously~~. But she remembered that, soon after the diagrammatic material had been received, ^{Der Heer} ~~Devries~~ began asking ^{it was likely} ~~her~~ whether she could imagine that ^{the machine} ~~what was being illustrated~~ was within reach of the Earth's ~~present~~ economy and technology. She could offer him little reassurance on either score. She recalled again how preoccupied Ken had seemed in the last few weeks, sometimes even jittery. His responsibilities in this matter were, of course . . .

^{Der Heer} "Are Dr. ~~Devries~~ and Dr. Kitz staying at the same hotel as you?"

"No, they're staying at the Embassy." *It* It was always the case, because of the nature of the Soviet economy, that Russians had little

hard currency when visiting the West. They were obliged to stay in second or third rate hotels -- even rooming houses -- while their Western colleagues lived in comparative luxury. It was a continuing source of embarrassment for scientists of both countries. Picking up the bill for this relatively simple meal would be effortless for Ellie and some fair burden for Vaygay, despite his comparatively exalted status in the Soviet scientific hierarchy. Now what was Vaygay . . .

"Vaygay, be straight with me. What are you saying? You think Ken and Mike Kitz are jumping the gun?"

"'Straight.' An interesting word. Not right, not left, just progressively forward. I'm concerned that in the next few days we will see premature discussion about building something ~~when we have no~~ ^{that we have no} ~~idea what it is.~~ ^{right to build.} ~~You and I know how little we know.~~ The politicians think we know everything. ~~It's important that they appreciate our~~ ~~ignorance.~~ ^{In fact we know almost nothing. Such a situation could be dangerous.} ~~This situation~~

"You want me to talk to Ken?"

"If you think it's appropriate. You have frequent opportunities to talk to him?"

"Vaygay, you're not jealous are you? I think you picked up on my feelings for Ken -- when you were back at Argus -- before I did. Ken and I've been more or less together for the last two months.

[CHECK] Do you have some reservations?"

"Oh no, Ellie. I am not your father or, as you know, a jealous lover. I wish only great happiness for you. It's just that I see so many unpleasant possibilities. "

They returned to their preliminary interpretations of some of the diagrams, with which ~~they~~^{was} eventually covered the table. For counterpoint, they also discussed a little politics, U.S. support of South Africa, the ~~growing~~ talk in Africa of a combined naval boycott of South Africa (Cote d'Ivoire had volunteered two ^{ancient} frigates, all the capital ships in ~~the~~^{its} tiny navy), and the growing war of words between the Soviet Union and the German Democratic Republic. As ~~usual~~^{always}, Arroway and Lunacharsky enjoyed denouncing their countries' foreign policy^{ies} to one another. Over a ritual dispute about whether the check should be shared, the downpour had diminished to a discreet drizzle.

It was far more interesting and far more informed than the more fashionable practice of denouncing the foreign policies of each other's nation.

* * * *

By now, the news of the Message from Vega had reached every nook and cranny of the planet Earth. People who knew nothing of radio

telescopes, people who had never, even once in their lives, heard of a prime number, had at least been told a ^{peculiar} ~~strange~~ story about ~~of~~ a voice from above, about strange beings -- not exactly men, ^{but} ~~and~~ not exactly gods -- who had been discovered living in the night sky. Their home star could easily be seen, even with a full moon, ~~provided that the night was clear.~~ Amidst the continuing frenzy of sectarian commentary, there was also -- all over the world, it was now apparent -- a sense of wonder, even of awe. Something transforming, something almost miraculous had happened. The air was full of possibility, a sense of a new beginning. "Mankind has been promoted to Junior High School," ^{an} ~~the most famous~~ American newspaper editorialist ^{ist} had written. ✓

There were other intelligent beings. We could communicate with them. They were probably older than we, possibly wiser. They were sending us libraries of complex information. So the specialists in every subject began to worry. Mathematicians worried about what elementary discoveries they might have missed. Religious leaders worried that Vegan values, however alien, would find ready adherents, especially among the uninstructed young. Astronomers worried that there might be fundamentals about the nearby stars they had gotten wrong. Politicians and government leaders worried that some other systems of government, quite different from those currently fashionable, might be admired by a superior civilization. Whatever

Vegans knew had not been influenced by peculiarly human institutions, history, or biology. What if much that we think true is a misunderstanding, a special case, a logical blunder? Experts, ~~almost involuntarily~~, began uneasily to reassess the foundations of their ~~fields~~ subjects.

But beyond this narrow vocational disquiet was the great soaring perception of a new adventure for the human species, of turning a corner, of bursting into a new age -- a symbolism powerfully amplified by the approach of the Third Millennium. There were still political conflicts, some of them -- like the perceptibly warming growing South African crisis -- serious. But there was also a notable decline, in many quarters of the world, of jingoist rhetoric and puerile

self-congratulatory nationalism. There was a sense of the human billions of tiny dots spread out over the surface of a run-of-the-mill world, species collectively presented with an unprecedented opportunity, or even ~~possibly~~ a grave common danger. To many it seemed absurd for the contending nation states to continue their ~~tedious and perilous~~ deadly quarrels, faced with a non-human civilization of vastly greater capabilities. In the past half-year, the divestment ~~deaccessioning~~ of nuclear weapons by the United States and the Soviet Union had made major new strides, with fairly intrusive inspection teams of each nation soon to be installed on the territory of the other. The military staffs of both nations publicly voiced disapproval and concern. The United Nations found itself ~~had somehow~~ suddenly ~~become more~~ effective in mediating international disputes, with the

West Irian and the Chile/Argentina border wars both apparently resolved. There was even talk, not all of it fatuous, of a non-aggression treaty between NATO and the Warsaw Pact. The delegates arriving at the First Plenary Session of the World Message Consortium were predisposed toward cordiality to an extent unparalleled in recent decades.

Every nation with even a handful of bits of Message data was represented, ^{each sending both} ~~Each nation had~~ scientific and political delegates; ~~and~~ ~~for Ellie~~ a surprising number sent military representatives, ^{as well}. In a few cases, national delegations were led by Foreign Ministers or even Heads of State. The United Kingdom delegation included Viscount Boxforth, the Lord Privy Seal, an honorific Ellie found hilarious.

B. Ya. Abukhimov ^{Stefan Barnaba, the new}
The U.S.S.R. delegation was headed by ~~the~~ ^{Gotsridze,} President of the Soviet Academy of Sciences, with ~~B.~~ ^{Arkhangelsky} the Minister of Medium Heavy Industry, and playing ~~a~~ significant role. ^{Der Heer} The President had insisted that ~~DeVries~~ head the American delegation, although it included the Undersecretary of State and Michael Kitz, among others, for the Department of Defense.

A vast and elaborate map in equal-area projection showed the disposition of radio telescopes over the planet, including the Soviet ocean-going tracking vessels. She glanced around the newly completed conference hall, adjacent to the offices and residence of the President of France. In only the second year of his ten-year [CHECK]

term, he was making every effort to guarantee the meeting a success. A multitude of faces, flags, and national dress was reflected off the long arcing mahogany tables and the mirrored walls. She recognized few of the political and military people, but in every delegation there seemed to be at least one familiar scientist or engineer: ^{Ian Broderick} Annunziata and ~~Mongo Jones~~ from Australia, Fedirka from Czechoslovakia, Braude, Crebillon and Boileau from France, Kumar Chandrapurana and Devi Sukhavati from India, Hironaga and Matsui from Japan . . . Ellie reflected on the strong technological rather than radioastronomical background of many of the delegates, especially the Japanese. The idea that the construction of some vast machine might be on the agenda of this meeting had forced last-minute changes in the composition of delegations.

You could look up at the mirrored ceiling, Ellie discovered, and see the conference laid out in a panorama above you -- milling delegates, French security personnel, and ^{the} mobile computers, circumnavigating a tier of seats in a regular moving queue, ^{ed} one machine rolling smartly into its receptacle, and the remainder closing ranks. ^{ed} Mocos, they were beginning to be called. The abundance of new generation mobile personal computers at this meeting was indebted, no doubt, to the compatible housings and telephone modems regularly spaced around the tiers. Many scientists had a personal computer of this sort, one that knew his idiosyncracies and past history; both had learned from a set of shared experiences, servant and master.

Mocos had not yet spread much to the general public, but in universities, research institutes, or teaching hospitals, you would sometimes find yourself in a room in which there were as many mobile computers as people. They had a resting mode that expended very little data processing energy, so you could sometimes see pairs of humans and mobile computers boarding commercial aircraft that lacked appropriate housings and energy sources for the Mocos. The computer would sit stolidly in its own seat (they were much too fragile to travel as freight), conscientiously not thinking for the entire flight. Mass-produced mobile computers tended to be oblong-shaped, about three-quarters of a meter high, with a battery mechanism that whirred as it accelerated and a dazzling data processing rate. There were differences from one model to another in environmental sensors, in the disposition of searchlights and running lights for night use; on the intensity, color and arrangement of the laser rangefinders, and even on how the memory modules were stacked around the cryogenics. She herself could not see the point of a mobile computer that was too big to go ^{many places} ~~everywhere~~ with you, and that required a seat for itself in air travel. She noted at least three Mocos in the Japanese delegation, reasonable enough since Japan was the world leader in the design and production of Mocos, a natural offspring of the marriage between the Japanese automotive and computer industries. For this meeting, at least modest computer capabilities and high resolution

graphics were needed, because presumably there would be detailed examination of texts and diagrams. But even some of the large Mocós, she was sure, would be used for nothing more complex than summoning up the names and preferred euphorants of the delegates's spouses.

She could make out Malatesta of Italy; Bedenbaugh, a ~~scientist~~ *physicist* fallen into politics, Clegg, and the venerable Sir Arthur Chatos chatting languidly behind ~~a desk-model~~ *the sort of a you can find on restaurant tables in European resorts;* Union Jack; Jaime Ortiz of *Venezuela;* ~~Spain;~~ Prebula from Switzerland, which was puzzling since Switzerland did not, so far as she knew, even have a radio telescope; Bao, who had done brilliantly in putting together the Chinese radio telescope array; surprisingly large Saudi and Iraqi delegations; Wintergaden from Sweden; and, of course, the Soviet delegation. Nadya Rozhdestvenskaya and Genrik Arkhangelsky were sharing a moment of genuine hilarity. ~~Their names, she suddenly realized, meant Christmas and Archangel. There were also Soviet scientists whose names signified Trinity and Easter. [CHECK]. It was curious, this retention in the nominally atheist U.S.S.R. of prerevolutionary Christian names. On the other hand, there was no reason for them to feel a diminished attachment to their ancestors because of official doctrinal sanctions, past or present.~~ *For* She looked for Lunacharsky, and finally spotted him at the Chinese delegation. He was shaking hands with Chun-ying Bao [CHECK], the Director of the Beijing Radio Observatory. She recalled that the two men had been friends and

colleagues during the period of Sino-Soviet cooperation. But the hostilities between their two nations had ended all contact between them, and Chinese restrictions on foreign travel by their senior scientists was still almost as severe as ~~in the~~ ^{the constraints.} Soviet Union. She was witnessing, she realized, their first meeting in perhaps ~~25 years.~~ ^{a quarter century.}

"Who's the old Chinaperson Vaygay's shaking hands with?" This was, for Kitz, an attempt at cordiality. He had been making small offerings of this sort for the last few days, a development she ~~regarded with distaste~~ ^{as unpromising.} considered unpromising.

"Bao, the Director of the Beijing Observatory."

"I thought those guys hated each other's guts."

"Michael," she said, "the world is both better and worse than you imagine."

"You can probably beat me on 'better,'" he replied, "but ~~I don't~~ ^{you can't hold a candle to me on} ~~think you're a serious contender for~~ 'worse.'"

* * * *

After the welcome by the President of France (who, to mild astonishment, stayed to hear the opening presentations), and a discussion of procedure and agenda by the conference co-chairmen, ~~Dor Heer and Boris Abukhimov~~ ^{DeVries and [PRESIDENT OF THE SOVIET ACADEMY],} Ellie and Vaygay together summarized the data. They made what were by now standard presentations -- not too technical, because of the political and military people -- of how radio telescopes work, the distribution of nearby stars in space, and the history of the palimpsest message. Their tandem presentation concluded with a survey, displayed on ^{the} monitors ^{before} ~~in~~ each delegation, of the diagrammatic material recently received. She was especially careful to show how the polarization modulation was converted into a sequence of zeros and ones, how the zeros and ones fit together to make a picture, and how in most cases we had not the vaguest notion what the picture showed. The data points reassembled themselves on the computer screens. She could see faces illuminated in white, amber and green by the monitors in the now partly darkened conference hall. ^{The diagrams showed} ~~There were~~ intricate branching networks; lumpy, almost indecently biological forms; a perfectly ^{formed} regular dodecahedron ^{slowly tumbling}. A long series of pages had been reassembled into an elaborately detailed three-dimensional construction which slowly rotated. Each enigmatic object was joined by an unintelligible caption. Vaygay stressed the uncertainties still more strongly than she. Nevertheless, it was, in his opinion, now beyond doubt that the Message was a handbook for the construction of a machine. He

neglected to mention that the idea of the Message as a blueprint had originally been his and ~~Arkhangel'sky's~~ Academician A's; and Ellie seized an opportunity to rectify the oversight.

She had talked about this subject enough over the past few months to know that both scientific and general audiences were ^{often} fascinated by the details of the unraveling of the Message, and tantalized by the still unproved concept of a primer. But she was unprepared for the response from this -- one would expect -- staid audience. Vaygay and she had interdigitated their presentations. As they finished, there was a sustained thunderclap of applause. The Soviets, and ^{Eastern} ~~some~~ ^{European} ~~other~~ delegations applauded in unison, with a ~~synchronized~~ frequency of about two or three handclaps per heartbeat. The Americans and many others applauded separately, their handclaps unsynchronized, a sea of white noise rising from the crowd. Amidst an unfamiliar kind of joy, she could not resist thinking about the differences in national character -- the Americans utterly individualist, and the Russians engaged in a collective ^{endeavor.} ~~enterprise~~. Also, in crowds, she seemed to recall, Americans tried to maximize their distance from their fellows, while Soviets tended to lean on each other as much as possible. Both styles of applause, the American clearly dominant, ~~warmed and~~ ^{She thought about Staughton.} delighted her. ~~the appreciation and perhaps even love of the delegates sweeping her up and carrying her aloft.~~

After lunch there was a succession of other -- mainly U.S. and Soviet -- presentations on the data collection and interpretation.

David Drumlin ~~gave~~ st an extraordinarily capable discussion of a statistical analysis he had recently performed of all previous pages of the Message on which were references to the ^{new} numbered diagram ^{contained} pages. He argued that the Message ~~was~~ not just a blueprint for building a machine, but also descriptions of the designs and means of fabrication of components and subcomponents. In a few cases, he thought, there were descriptions of whole new industries not yet known on Earth. Ellie, mouth agape, shook her finger towards Drumlin, silently asking Valerian whether he had known about this. His lips pursed, ^{Valerian} ~~he~~ hunched his shoulders and rotated his hands palms up. She scanned the other delegates for some expression of emotion, but could detect mainly signs of fatigue; the depth of technical material, and the necessity, sooner or later, of making political decisions were already producing strain. Afterwards she complimented Drumlin on the interpretation but asked why she had not heard of it until now. He replied before walking away ~~smiling~~, "Oh, I didn't think it was important enough to bother you with. It was just a little something I did while you were out consulting ~~rustic~~ religious fanatics."

If Drumlin had been her thesis advisor, she would still be pursuing her Ph.D., she thought. ^{He had never fully accepted her. They would} ~~Their relation was doomed never to~~ ^{never share an easygoing, collegial relationship.} ~~be collegial.~~ Sighing, she wondered whether Ken had known ^{about Drumlin's new} ~~and not~~ ^{work.} ~~told her.~~ But as conference co-chairman, ^{Dr. Herr} ~~DeVries~~ was sitting with his Soviet opposite number on a raised dais facing the horseshoe of

delegate tiers. He was, as he had been for weeks, nearly inaccessible. Drumlin was not obliged to discuss his findings with her. She knew they both had been ^{preoccupied} busy recently. ^{But} Why, in conversation with ^{him, why} Drumlin, was she always accomodating, and argumentative only ~~with~~ ^{in extremis?} ~~great difficulty?~~ A part of her evidently still felt ^{that} as if the granting of her doctorate, and the opportunity to pursue her science, were still ^{remote} ~~future~~ possibilities firmly in Drumlin's hands.

* * * *

On the morning of the second day, a Soviet delegate was given the floor. He was unknown to her. "Stefan Alexeivich Baruda," the vitagraphics on her computer screen read out. "Director," it continued, "Institute ^{for Peace Studies} ~~of the U.S.A. and Canada~~, Soviet Academy of Sciences, Moscow; Member, Central Committee, Communist Party of the ^{USSR.} ~~Soviet Union.~~"

"Now we start to play hardball," she could hear Michael Kitz saying to Elmo Hunnicutt of the State Department. Baruda was a dapper

man, wearing an elegantly tailored and impeccably fashionable Western business suit, perhaps of Italian cut. His English was fluent, and

almost unaccented. He had been born in one of the Baltic Republics,

was young to be head of such an important organization, and was

a leading example of the "new wave" in the Soviet leadership.

-- recently formed to study the longterm implications for strategic policy of the disintegration of nuclear weapons --

"Let us be frank," Baruda was saying. "A Message is being sent to us from the far reaches of space. Most of the information has been obtained by the Soviet Union and the United States. Essential pieces have also been obtained by other countries. All of those countries are represented at this conference. Any one nation -- the Soviet Union, for example -- could have waited until the Message repeated itself several times, as we all hope it will, and fill in the many missing pieces in such a way. But ~~for all we know~~ it might take years, and we are a little impatient. So we have all shared the data.

"Any one nation -- the Soviet Union, for example -- could ~~also~~ place into orbit around the Earth large radio telescopes with sensitive receivers that work at the frequencies of the Message. The Americans could do this as well. Perhaps Japan, or the European Space Agency could. Or France. But that might be thought a hostile act, an effort by one country to gain all the data for itself, without cooperating with other nations. Such a hostile act might even be dangerous. It is no secret that the United States or the Soviet Union might be able to shoot down such satellites. ~~So, again,~~ ^{perhaps for this reason, too,} we have all shared the data.

"It is better to cooperate. Our scientists wish to exchange not only the data they have gathered, but also their fantasies, their guesses, their . . . dreams. All you scientists are alike in that respect. ~~I am not a scientist. My field is government. So I know that~~ But the nations are also alike. Every nation is cautious. Every nation is suspicious. None of us would give an advantage to a potential ~~enemy~~ ^{adversary} if we could prevent it. And so there have been two opinions -- ~~maybe~~ ^{perhaps} more, but at least two: one that counsels exchange of all the data, and another that counsels the ~~benefit~~ ^{advantage} of one nation over another. 'You can be sure the other side is seeking some advantage,' they say. It is the same in most countries.

"The scientists have won this debate. So, for example, much of the data -- although, I wish to point out, not all of it -- acquired by the United States and the Soviet Union have been exchanged. Most of the data from all other countries have been exchanged worldwide. We are happy we have made this decision."

Ellie whispered over to Kitz, "This doesn't sound like 'hardball' to me."

~~"Stay tuned,"~~
~~"This is just the warmup, sweetie,"~~ he whispered back.

"But there are other kinds of dangers. We would like now to raise one of them for the Consortium to consider." Baruda's tone reminded her of Vaygay's at lunch the other day. What was the bee in the Soviet bonnet?

"We have heard Academician Lunacharsky, Dr. Arroway, and other scientists agree that we are receiving the instructions for building

~~some~~^a ~~very~~ complex machine. Suppose that, as everyone seems to expect, the end of the Message comes; the Message recycles to the beginning; and we receive the introduction or -- the English word is 'primer' ? -- which lets us read the Message. Suppose also that we continue to cooperate fully, all of us. We exchange all the data, all the fantasies, all the dreams.

"Now the beings on Vega, they are not sending us these instructions for their amusement. They want us to build a machine. Perhaps they will tell us what the machine is supposed to do. Perhaps they won't. But even if they do, why should we believe them? So I raise my own fantasy, my own dream. It it is not a happy one. What if this machine is a Trojan Horse? We build the machine at great expense, turn it on, and suddenly an invading army pours out of it . . . Or what if it is a Doomsday Machine? We build it, turn it on, and the Earth blows up. Perhaps this is their way to suppress civilizations just emerging into the Cosmos. It would not cost much: they pay only for a telegram, and the upstart civilization ~~promptly~~^{obediantly} blows itself up.

~~"I emphasize that~~["] what I am about to ask is only a suggestion, a talking point. I raise it for consideration. ^{I mean it to be constructive.} On this issue, we all share the same planet, we all have the same interests. ^{Here is my question:} Would it be better to burn ~~all~~ the data and destroy ~~all~~ the radio telescopes?"

A minor commotion ensued. Many delegations asked simultaneously to be recognized. Instead, the conference co-chairmen seemed mainly


motivated to remind the delegates that sessions were not to be recorded or videotaped, ~~a prohibition which applied especially to Mocos (which could, of course, record surreptitiously)~~. No interviews were to be granted to the press. There would be daily press releases, agreed upon by the conference co-chairmen and the leaders of delegations. The integuments of the present discussion were to remain in this conference chamber. ^{Baruda is right about a} Several delegates asked for clarification from the chair. "If ~~the Trojan Horse hypothesis is right, or the~~ ^{it} Doomsday Machine hypothesis," shouted out a Dutch delegate, "isn't ^{it} our duty to inform the public?" But he had not been recognized, ^{and} his microphone had not been activated. They went on to other, more urgent, matters.

Ellie had quickly punched into the institutional computer terminal before her, for an early position on the queue. She discovered that she was scheduled second, after Sukhavati and before one of the Chinese delegates.

Ellie knew Devi Sukhavati a little. An attractive woman in her mid-forties, she was wearing a Western coiffure, high-heeled sling-back pumps, and an exquisite silk sari. Originally trained as a physician, she had become one of the leading Indian experts in molecular biology, now sharing her time between Kings College, Cambridge, and the Tata Institute in Bombay. She was one of a handful of Indian Fellows of the Royal Society of London, ^{and} ~~she~~ was said to be well-placed politically. They had last met a few years before at an

international symposium in Tokyo. That was before receipt of the Message eliminated the obligatory question marks in the titles of some of their scientific papers. Ellie had sensed a mutual affinity, due ~~only~~ in part to the fact that they were among the few women participating in scientific meetings on extraterrestrial life.

"I recognize that Academician Baruda has raised an important and sensitive issue," Sukhavati began, "and it would be foolish to dismiss the Trojan Horse possibility carelessly. Given most of recent history, this is a natural idea, and I'm surprised it took so long to be raised. However, I would like to caution against such fears. It is unlikely in the extreme that the beings on a planet of the star Vega are exactly at our level of technological advance. Even on our planet, cultures do not evolve in lockstep. Some start earlier, others later. I recognize that some cultures ^{at least technologically.} can catch up. When there were high civilizations in India, China, Iraq and Egypt, there were ^{at bests} ~~only~~ iron-age nomads in Europe and America and Russia. ^{Q"} But the differences in the technologies will be much greater in the present circumstances. The extraterrestrials are likely to be far ahead of us, certainly more than a few hundred years further along -- perhaps thousands of years ahead of us, or even millions. Now, I ask you to compare that with the pace of human technological advancement in the last ^{century. Q"} ~~hundred years.~~ I grew up in a tiny village in South India. In my grandmother's time the ^{+ treadle sewing machine} ~~flatiron~~ was a technological wonder. What would beings who are thousands of years ahead of us be capable of? Or



millions of years ahead? As a philosopher in our part of the world once said: 'The artifacts of a sufficiently advanced extraterrestrial civilization would be to us indistinguishable from magic.'

"We can pose no threat to them whatever. They have nothing to fear from us, and that will be true for a very long time. This is no confrontation between Greeks and Trojans, ^{who} ~~they~~ were evenly matched. This is no science fiction movie where beings from different planets fight with similar weapons. If they wish to destroy us, they can certainly do so . . . "

"But at what cost? Don't you see? That's the point. Baruda is saying our television broadcasts to space are ^{their notice} ~~the reason for them to~~ ^{time to} destroy us, and the Message is the means. [↑]

"Punitive expeditions are dear. The Message is cheap."

Ellie could not make out who ⁵ ~~5~~ It seemed to be someone in the British delegation. ⁵ ~~5~~ had shouted this intervention. ^{His remarks had} ~~It was not~~ been amplified by the audio system, because again the speaker had not been recognized by the Chair. ^B But the acoustics in the conference hall were sufficiently good that he could be heard perfectly well. ^{Der Heer} ~~Devries~~, in the Chair, tried to keep order. ^{Abukhimov} ~~consulted with~~ ^{leaned over, and whispered something to} ~~an aide.~~

"You think there is a danger in building the machine," Sukhavati ^{replied.} ~~continued.~~ "I think there is a danger in not building the machine. I would be ashamed of our planet if we turned our back on the future, ~~on~~ ~~cosmic citizenship.~~ Your ancestors," she shook ^a ~~her~~ finger at her interlocutor, "were not so timid when they first set sail for India or America."

This meeting was getting to be full of surprises, Ellie thought, although she doubted ~~that~~ ^{whether or} Clive and Burgoyne were the best models for present decision-making. Perhaps Sukhavati was only tweaking the ^{for past colonial offenses.} British. She waited for the green speaker's light on her console to illuminate, indicating that her microphone was activated.

"Mr. Chairman." She found herself, in this formal and public posture, addressing ^{Der Heer,} ~~De Vries~~, whom she had hardly seen in the last few days. They had arranged to spend tomorrow afternoon -- a break in the meeting -- together and she felt some anxiety about ~~the~~ ^{what they} ~~would say. Oops, wrong thought, she thought.~~ ^{would say.} conversation they would have.

"Mr. Chairman, I believe we can shed some light on the Trojan ^{these two questions --} Horse ^{and} ~~question~~, the Doomsday Machine ~~question~~. I had intended to discuss this tomorrow morning, but it ~~certainly~~ seems relevant now." On her console, she punched in the code numbers for a few of her slides. The great mirrored hall darkened.

Dr. Lunacharsky and I are convinced that these are different projections of the same three-dimensional configuration. We showed the entire configuration in computer-simulated rotation yesterday. We think -- we can't be sure -- but we think that this is what the interior of the machine will look like. There is as yet no clear indication of scale. Maybe it's a kilometer across. Maybe it's supposed to be submicroscopic. But notice these five objects evenly ^{spaced} ~~placed~~ around the periphery of the interior chamber. Here's a closeup of one of them. ^{They're} ~~It's about~~ the only things in the ^{chamber} ~~room~~ that looks at all recognizable.

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^{This} "It appears to be a ~~carefully~~ ^{oversluffed} ~~contoured~~ ^{an ordinary form} chair, perfectly designed ^{configured} for a human being. It's very unlikely that extraterrestrial beings, evolved on another quite different world, would resemble us sufficiently to share the same design^s for living room furniture. Here, look at this closeup. It looks like something from my mother's ^{seemed that} spare room, when I was growing up." ~~Indeed, it even looked as though it had flowered~~ ^{slipcovers} A small flutter of guilt entered her mind. She had neglected to call her mother before leaving for Europe. She must have called her only once since the Message was received. ^{How could you, Ellie,} she remonstrated with herself.

"So it's our contention -- Dr. Lunacharsky and I -- that the five chairs are meant for us. For people. That would mean that the interior chamber of the machine is only ~~about four~~ ^{a few} meters across, the exterior, perhaps ten or twenty meters across. The technology is undoubtedly formidable, but we don't think we're talking about building something the size of a city. Or as complex as an aircraft carrier. We might very well be able to build this, whatever it is, if we all work together.

"What I'm trying to say is that you don't put chairs ^{inside} ~~on~~ a bomb. I don't think this is a Doomsday Machine, or a Trojan Horse. I agree with what Dr. Sukhavati ^{said, or maybe only} implied -- the idea that this is a Trojan Horse is itself an indication of how far we have to go."

Again there was an outburst. But this time ^{Der Heer} ~~Devries~~ ^{indeed, he} not only made no effort to stop it; ~~but~~ actually turned the complainant's microphone on. It was the same delegate who had interrupted Sukhavati a few

minutes earlier, Philip Bedenbaugh of the United Kingdom, a Labour Party minister in the shaky coalition government.

"... simply don't understand what the concern is. If it was literally a wooden horse, we would not be tempted to bring the alien device within the city gates. But flounce it up with some upholstery

and our suspicions are allayed. Why? Because we are being

flattered. There's a wizard adventure implied. There's the promise of new technologies. No matter what lofty fantasies the

may entertain, if there is even a tiny chance the machine is a means of destruction, it should not be built. Better, as the Soviet delegate has proposed, to burn the data tapes and make the construction of radio telescopes a capital crime."

The meeting ^{was} ~~was~~ becoming almost unruly. Scores of delegates were electronically queuing for authorization to speak. The hubub rose to a subdued roar that reminded Ellie of her years of listening to radioastronomical static. A consensus did not seem readily within reach, and the co-chairmen were clearly unprepared to restrain the delegates.

As the Chinese delegate rose to speak (most previous talks had been made from a sitting position), the vitagraphics were slow to appear on Ellie's screen and she looked around for help. She had no idea who this man was either. Nguyen "Bobby" Bui, a National Security Council staffer now assigned to ^{Der Heer} ~~Devries~~, leaned over: "Wang Xi's his name. Spelled 'ex,' 'eye.' Pronounced 'she.' Heavy dude. Born on

There's a hint of acceptance by -- to put it? how shall I say? -- greater beings.

Or bribed:

an historic

But I say

radio astronomers scientists

the Long March. Volunteer in Korea. ^{Check not too young]} Government official, mainly political. Knocked down for a nine-count in the Cultural Revolution. Central Committee Member now. Very influential. Been in the news lately -- ^{also} directs Chinese archeological ^{Y."} ~~digging.~~

Wang (or was it Xi? She wasn't sure which was his given name and which was his surname) was a fairly tall, broad-shouldered man around 60. The wrinkles on his face made him seem older, but his posture and physique ^{gave him a younger appearance.} ~~made him look younger.~~ He wore his tunic buttoned at the collar in the fashion that was as obligatory for Chinese political leaders as three-piece suits were for American governmental leaders, the President, of course, excepted. The vitagraphic now came through on her console, and she could remember having read a long article about Wang Xi in one of the video news magazines.

"If we are frightened," he was saying, "we will do nothing. That will delay them a little. But, remember, they know we are here. Our television arrives at their planet. Every day they are reminded about us. Have you looked at our television programs? They will not forget us. If we do nothing and if they are worried about us, they will come to us, machine or no machine. We cannot hide from them. If we had kept quiet we would not face this problem. If we had cable television only and no big military radar then maybe they would not know about us. Maybe. But now it is too late. We cannot go back. Our course is set.

"If we are seriously frightened about this machine destroying the Earth, do not build it on the Earth. Build it somewhere else. Then if it is a Doomsday Machine and blows up a world . . . it will not be our world. But this will be very expensive. Probably too expensive.

"Or, if we are not so frightened, build it in some isolated desert. You could have a very big explosion in the Takopi Wasteland in Sinqiang Province and kill nobody.

"And if we are not frightened at all, we can build it in Washington. Or Moscow. Or Beijing. Or in this beautiful city.

"In ^{Ancient} China, ^{we} Vega and two nearby stars ~~are~~ called Chih Neu. It means the young woman with the spinning wheel [CHECK NOT SPINNING LIKE A TOP]. It is an auspicious symbol, a machine to make new clothes for the people of the Earth.

"We have received an invitation. A very unusual invitation. Maybe it is to go to a party. The Earth has never been invited to a party before. It would be impolite to refuse."

* * * *

Chap. 12

27 September, 1984

THE ONE-DELTA ISOMER

It was a splendid autumn afternoon, so unseasonably warm that Devi Sukhavati was able to leave her coat behind. They walked along the crowded Champs d'Elysee toward L'Obelisque. [CHECK SPELLING] The ethnic diversity was rivaled by London, Manhattan, and only a few other cities on the planet. Two women walking together, one in a skirt and sweater, the other in a sari, seemed in no way ~~noteworthy~~ ^{unusual}.

Outside a tobacconists' ⁽ⁿ⁾ there was a long, orderly and polyglot line of people attracted by the first week of legalized sale of cured cannabis cigarettes from the United States. Although cannabis was not habit-forming as, for example, ^{nicotine} ~~tobacco~~ ^{were,} or ethanol, it was considered at best distracting for the young¹, and by French law could not be sold to those under 18 years of age. Many in line were middle-aged and older. Some might have been naturalized Algerians or Morroccans. Especially potent varieties of cannibis were grown, mainly in California and Oregon, for export only. Featured here was a new and admired strain, which had in addition been grown in ultraviolet light, converting some of the inert cannabinoids into the $^1\Delta$ isomer. It was called "Sun-Kissed." The package, illustrated in a window display a meter-and-a-half high, bore in French the slogan, "This will be deducted from your share in Paradise." It was the same phrase with

which Dr. Moreau in the 1840's, distributed a spoonful of green hashish paste to each Boulevardier of Le Club des Haschischins.

[CHECK SPELLING]

The shop windows along the boulevard were a riot of color. They bought chestnuts from a street vendor, and reveled in ~~both~~ ^{the} taste and texture. For some reason, every time Ellie saw a sign advertising the Banque Nationale ~~e~~ de Paris [CHECK SPELLING] (BNP), she read it as the Russian word for beer, with the middle letter inverted left to right. "BEER," the signs seemed to be exhorting her, ~~deflected~~ ^{-- lately corrupted} from their ~~usual~~ ^{usual} and respectable fiduciary vocations, "RUSSIAN BEER." The incongruity amused her, and only with difficulty could she convince the part of her brain in charge of reading that this was the Latin, not the Cyrillic alphabet. Further on, they marveled at L'Obelisque [CHECK SPELLING] -- an ancient military commemorative stolen at great expense to become a modern military commemorative. They decided to walk on.

~~Devries~~ ^{Der Heer} had broken the date. At least that's what it amounted to. He had called her up this morning, and ~~was~~ apologetic, ~~although~~ ^{but} not desperately so. There were too many political issues being raised at the Plenary. The Secretary of State ~~was flying~~ in tomorrow, interrupting a visit to Cuba. ~~His~~ ^{Der Heer's} hands were full, and he hoped Ellie would understand. She understood. ~~She also knew that they were~~ ^{She hated herself for} ~~losing each other, and suddenly felt a wrenching, agonizing loss. On~~ ^{sleeping with him.} ~~herself, To avoid a painful, afternoon alone, just now,~~ ^{To distract} a whim, she had dialed Devi Sukhavati, ~~who had been delighted to spend the afternoon with Ellie.~~

"One of the Sanskrit words for 'Victorious' is 'Abhijit.'

[CHECK.] That's what Vega was called in ancient India. Abhijit. It

was under the influence of Vega that the ~~benevolent~~ Hindu divinities, *our culture heros,* conquered the Asuras, the gods of evil. *Ellie, are you listening?* Now, it's a curious thing.

~~Ellie~~ In Persia, the Asuras ~~or Ahuras~~ were the gods of good.

Eventually religions sprang up -- influential religions -- in

which the chief god, the god of light, the Sun god, was called Ahura

Mazda. The Zoroastrians, for example, and the Mithraists. *Ahura, Asura, it's the same name.* There are

still Zoroastrians today, and the Mithraists gave the Christians a *Mazda is the brand name of an American light bulb and a Japanese automobile.* good run for their money. But in this same story, ~~some of those good~~

divinities Hindu gods were called Devis. It's the origin of my own name. *In India, the Devis are gods of good. But*

Meanwhile, in Persia, the Devis became gods of evil. As probably you know, this is where the English word, devil, comes from. The symmetry is complete. All this is probably some vaguely remembered account of the Aryan invasion that pushed the Dravidians, ~~including~~ my ancestors, to the South. So, depending on which side of the Kirthar Range one lives on, Vega ~~was on the side~~ *supports* either of God or the Devil."

This cheerful story had been proffered as a gift by Devi, who clearly had heard something of Ellie's *California* religious adventures ten days before. Ellie was grateful. But it reminded her that she had not even mentioned to Joss the possibility that the Message was the blueprint for a machine of unknown purpose. Now, he would be hearing all this through the media. She should really, she told herself sternly, make an overseas call to explain to him the new

developments. But Joss was said to be in seclusion. He had offered no public statement following their meeting in Orange County. Rankin, in a press conference, said that while there might be some dangers, he was not opposed to letting the scientists receive the full Message. But translation was another matter. Periodic review by all segments of society was required, he said, especially by those devoted to spiritual and moral values.

They were now approaching the Tuilleries Gardens where the elegant hues of autumn were on display. Frail and elderly men -- Ellie judged them to be from Southeast Asia -- were in vigorous dispute. Ornamenting the black cast^firon gates were multicolored balloons on sale. At the center of a pool of water was a marble Amphitrite. Around her, toy sailboats were racing, urged on by an exuberant crowd of small children with Magellanic aspirations. A catfish suddenly broke water, swamping the lead boat, and the boys and girls became subdued, chastened by this wholly unexpected apparition. The Sun was low in the West, and Ellie felt a momentary chill.

They approached L'Orangerie, in the annex of which was a special exhibition, so the poster proclaimed, "Images Martiennes" [CHECK FRENCH]. The joint American/French/Soviet robot roving vehicles on Mars had produced a spectacular windfall of color photographs, some -- like the Voyager images of the outer solar system around 1980 -- soaring beyond their mere scientific purpose, ^{and} becoming art. The

poster featured a ~~stunning~~ landscape photographed in the vast Elysium plateau. In the foreground was a three-sided pyramid, smooth, highly eroded, with an impact crater near the base. It was produced by millions of years of high-speed sandblasting by the fierce Martian winds, the planetary geologists had said. A second rover assigned to Cydonia, on the other side of Mars, had become mired in a drifting dune, and its controllers in Pasadena had been so far unable to respond to its forlorn radio cries for help.

Ellie found herself riveted on ~~huge black eyes, severely~~
~~Sukhavati's languid brown eyes, pulled-back [syn?] hair, erect~~
~~appearance, her~~ She thought to herself "I'm not
 graceful." bearing, and yet another magnificent sari, ~~presented an agreeable~~
~~appearance.~~ Usually, she
 Ellie found herself able to continue her part of the ~~re~~
 conversation while mentally addressing other matters as well. ~~She had~~ But today she
 had trouble following one line of thought, never mind two.
 always enjoyed some ability of this sort, but it seemed peculiarly
 while
 amplified today. They were discussing the merits of the several
 opinions
 positions on whether to build The Machine, but in her mind's eye she
 returned to ~~that~~ Devil's ~~3000 [CNR] years ago~~
 striking image from the Aryan invasion of India: a
 war between two peoples, each of ~~which~~ whom ~~which~~ whom
 patriotically exaggerated the historical accounts, so that Ultimately,
 the story was transformed into
 it became a war of the gods. "Our" side, of course, was good. The
 other side, of course, was evil. Ellie imagined the goateed,
 spade-tailed cloven-hooved Devil of the West evolving by slow
 evolutionary steps over thousands of years from some Hindu antecedent
 who, for all Ellie knew, had the head of an elephant and was painted
 blue.

"Baruda's Trojan Horse -- maybe it's not a completely foolish idea," she found herself saying. "~~Maybe there's~~ ^{some} wisdom in both positions. But I don't see that we have any choice. They can be here in twenty-some-odd years if they want to."

Print out
separately
To be inserted
in Chap. 19.

For some reason, Sukhavati laughed. "I was ~~only~~ thinking of a story I heard about wisdom," she explained. "It's very elusive. The biologist, J.B.S. Haldane, gave up his British citizenship, partly for political reasons, and emigrated to our country. He moved to Bhubineswar, [CHECK SPELLING] in Orissa [CHECK SPELLING] Province, adopted Indian dress and diet and became an Indian citizen. He truly loved our culture. He was facing many difficult decisions, and some of his Indian friends urged him to pray to Shahivastra [CHECK], the goddess of wisdom. But Haldane -- he was a man of considerable integrity -- replied that prayer to Shahivastra would be difficult, since, so far as he knew, the goddess did not exist. 'That's all right,' they told him. 'Neither do you.' Hindus are taught to take a long view."

They arrived at a monumental arch in the Roman style, surmounted by a heroic, indeed apotheotic, equestrian statue of Napoleon as chariot driver ~~← doubtless erected at the Emperor's behest~~ ^{maiest}. From the long view, from an extraterrestrial perspective, how pathetic this posturing was. They rested on a nearby bench, their long shadows cast over a bed of flowers ^{planted} in the colors of the French republic.

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It would, at the very least, be indiscreet.
[Ellie longed to discuss her own emotional predicament but that might have political overtones. She did not know Sukharati, very well. Instead, she encouraged her companion]

With a little encouragement, Devi began to speak about her personal life. She had been born to a Brahman but unprosperous family with matriarchal proclivities in the Southern state of Tamil Nadu. Matriarchal households were still common all over South India. She matriculated at what used to be called Benares Hindu University. The "Hindu" had, since Indian independence [CHECK.] been omitted. At medical school in England she had met and fallen deeply in love with Surindar Ghosh, a fellow medical student. But Surindar was of the

_____ caste, an untouchable, and her family threatened to disown her if she went ahead and married him. Her father said *that he had no daughter who would marry a Ghosh.* *he assured her,* He would mourn for her as if she had died. She married Surindar anyway

-- "We were too much in love, *I really had no choice.*" ~~it was impossible to do otherwise~~ --

who within the year himself died from septicemia acquired while performing an autopsy under inadequate supervision. Instead of reconciling her to her family, Surindar's death accomplished the opposite, and after receiving her medical degree, Devi decided to remain in England. She discovered a natural affinity for molecular biology and considered it ~~a natural~~ *an effortless* continuation of her medical studies -- "Cannon's doctrine of 'The wisdom of the body' seemed to me to contain the fidelity of DNA replication as a special case." She soon found she had real talent in this meticulous discipline. Knowledge of nucleic acid replication led her to work on the origin of life, and that in turn led her to consider life on other planets. "You could say that my scientific career has been a sequence of free

associations. One thing just led to another." She had recently been working on the characterization of martian organic matter, measured -- in a few locales on Mars only -- by the same roving vehicles whose stunning photographic products they had just seen advertised. Devi had never remarried, although she had made it plain there were some who pursued her. Lately she had been seeing a scientist in Bombay who she described as a "computer wallah."] [Remove this paragraph?]

By now they found themselves in ^{the Cour Napoleon,} ~~what had for many years been the~~ interior courtyard [CHECK] of the Louvre Museum. In ^{its} ~~the~~ center of the ~~courtyard~~ was the new and still controversial pyramidal entrance, and in high niches around the courtyard were sculptural representations of the heroes of French [World?] civilization. Captioned under each statue of a revered man -- they could see little evidence for revered women -- was his surname. [A FEW REPRESENTATIVE EXAMPLES, LAST NAMES ONLY.] Occasionally, letters were eroded -- by natural weathering, or, in a few cases, perhaps effaced by some offended passerby. For one or two statues, it was difficult to piece together On the statue that had evoked the greatest public resentment who the savant had been. One was labelled only LTA. [CHECK] remained.

Although the Sun was setting, and the Louvre was open until mid-evening, they did not enter, ^{but} ~~and~~ instead strolled along the Seine embankment, ~~following~~ the river back towards the Quai d'Orsay. [CHECK GEOGRAPHY] The proprietors of bookstalls along the embankment were fastening shutters and closing up shop for the day. For a while they strolled on, arm in arm in the European manner.

$10^{18} \text{ cm} \sim 26$
 $= 25 \times 10^{13} \text{ km}$

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French ^{strolling a few ~~pages~~ steps}
A ~~British~~ couple was walking ahead of them, each parent holding
a ^{four} hand of their daughter, a girl of about eight who would
periodically launch herself into the air, ^{off the pavement, exhilarated by the momentary suspension} to be momentarily suspended
In ^{her} the momentary suspension in the air ^{between her parents, she experienced it was} between her parents. They were clearly tourists on ^{apparent, something} a holiday, and it was interesting to hear them discussing the World ^{akin to ecstasy.}
which was hardly a coincidence:
The parents were discussing
Message Consortium Plenary, The newspapers had been full of nothing
else. The man was for building the machine; it might create jobs in
France, ^{new} and promote technological development. The woman was much
but for reasons she had difficulty ^{articulating} ~~putting into words~~. wholly
more cautious, The daughter, braids flying, was unconcerned, ~~for the~~
~~moment she possessed adventure enough.~~
about what to do with a blueprint from the stars.

* * * *

^{the Undersecretary of State,}
DeVries and Kitz, along with Honnicutt, ~~from State,~~ had called a
meeting at the American Embassy early the following morning, to
prepare for the arrival of the ~~American~~ Secretary of State later in
the day. The meeting was to be classified, held in the Embassy's
Black Room, a chamber electromagnetically decoupled from the outside

world, making even sophisticated electronic surveillance ~~virtually~~
Or so it was said. impossible. When she got the message at her hotel, after returning
 from the afternoon with Devi Sukhavati, she tried to call ~~DeVries~~ *Der Heer*
~~complain~~ but was able only to ~~talk with~~ *reach* Michael Kitz. She opposed
~~holding~~ a classified meeting on this subject on principle, she said;
 the Message was clearly intended for the entire planet. Kitz ~~argued~~ *replied*
 that there were no data being withheld from the rest of the world, at
 least by ~~the~~ Americans; and that the meeting was merely advisory --
 to assist the United States in the difficult procedural negotiations
 ahead. He appealed to her patriotism, to her self-interest, and
 finally invoked once again the ~~Logan~~ *Hadden* Decision. "For all I know, that
 thing is still sitting in your safe unread. Read it," he urged. She
 tried, again ~~unavailing~~ *unsuccessfully*, to reach ~~DeVries~~ *Der Heer*. First, the man turns up
 everywhere in the Argus facility, like a bad penny. He moves in with
You're sure, for the first time in years, you're in love.
 you in your apartment. The next minute you can't even talk to him ~~on~~ *get* to
answer the phone. She decided to attend the meeting, if only to see Ken face
 to face.

Kitz was enthusiastically for building the Machine, Drumlin
 cautiously in favor, ~~DeVries~~ *Der Heer* *at least outwardly uncommitted,* and
 Hunnicutt ~~discreetly undecided~~, and
 Peter Valerian in an agony of indecision. Kitz was even talking about
 where to build ~~it~~ *the thing.* Freightage costs alone made manufacture, or even
 assembly, on the far side of the Moon prohibitively expensive, *as Xi had guessed.*
Smart
Drumlin *places*
 Drumlin talked about the ~~S~~ Shield regions, near the centers of ~~the~~
 continents, geologically stable over hundreds of millions of years,

Smart, p. 12/10.

30 December 1984

CONTACT ✓

"~~[in how??]~~ ["] If we use aerodynamic braking, it's cheaper to send a kilogram to Phobos ^{or} ~~and~~ [!] Demos than to the far side of the Moon," Bobby Bui volunteered.

"What the hell are Phobos ^{or} ~~and~~ [!] Demos?" Kitz wanted to know.

"The moons of Mars. I was talking about aerodynamic braking in the Martian atmosphere."

"And how long does it take to get to Phobos ^{or} ~~and~~ [!] Demos?"

"Maybe two years, but once we have a fleet of inter-planetary transfer vehicles and the pipeline is full ..."

"Compared to three days to the moon?" asked Drumlin as if his gorge was rising. "Bui, ~~stop~~ stop wasting our time."

"It was only a suggestion," he protested. "You know, just something to think about."

Drumlin ignored him and went on.

and relatively untouched by the ravages of plate tectonics. The Canadian Shield was convenient to American technology, but might be too close to the arctic ice pack in case there was a disaster of less than planet-shattering dimensions. The Rhodesian Shield, in East Africa, he argued, was too hot, too inaccessible, and with too little skilled labor.

"It's the Zimbabwean Shield," ^{Der Heer} DeVries interjected. "It's in Zimbabwe. There isn't any Rhodesia anymore." ^{Never was, really.} ~~It was a rare example~~ ^{or even distracted Der Heer} ~~of DeVries being testy in the course of some official duty.~~ ^{was a rarity.} She took it as a hopeful sign. He was clearly under great pressure -- alternately avoiding her eyes and, she thought, making some unspoken appeal.

"Why are you guys in such a hurry to commit to construction?" she asked Kitz and Drumlin collectively. They were sitting next to each other with a plate of croissants between them. Kitz looked from Hunnicutt to DeVries before answering:

"This is a classified meeting," Kitz began. "We all know that ~~that~~ ^{It's like this:} you won't pass anything said here on to your Russian friends. We don't know what the Machine will do, but it's clear from Dave Drumlin's brilliant analysis that there's new technology in it, ^{is bound to have} probably new industries. Constructing the machine ~~has~~ ^{mean, think of what we'd learn --} economic value -- I and it might have military value. At least, that's what the Russians are thinking. See, the Russians are in a box. Here's a whole new area of technology they're going to have to keep up with the U.S. on.

Maybe there's instructions for some decisive weapon in the Message. Or some economic advantage. They can't be sure. They'll have to bust their economy trying. Did you notice how Baruda kept referring to what was cost-effective? If all this Message stuff went away -- burn the data, destroy the telescopes -- then they could maintain military parity. That's why they're cautious. So, of course, that's why we're gung ho for it."

He smiled. Temperamentally, Kitz was bloodless. But he was far from stupid. (He had noticed that when he was cold and withdrawn, people tended not to like him, and so he had developed an occasional veneer of urbane amiability. In Ellie's view it was a very thin veneer, ~~the~~ ^{an occasional} ~~was more~~ ^{was more} ~~molecular in thickness~~ ^{a molecular monolayer thick.}

"Now let me ask you a question," he continued. "Did you catch Baruda's remark about withholding some of the data? Is there any missing data?"

"Only from very early," she replied. "Only from the first few weeks, I'd guess. There were a few holes in the Chinese coverage a little after that. There's still a small amount of data that hasn't been exchanged, on all sides. But I don't see any signs of serious holding back. Anyway, we'll pick up any missing data swatches after the Message recycles."

"If the Message recycles," Drumlin growled.

^{Der Hoer}
~~A subdued DeVries~~ crisply moderated a discussion on contingency planning: what to do when the primer was received; which American,

German and Japanese industries to notify early about possible major development projects; how to identify key scientists and engineers for constructing the machine, if the decision was made to go ahead; and, briefly, the need to build enthusiasm for the project in Congress and with the American public. ~~Devries~~ ^{DerHeer} hastened to add that these would be contingency plans only, that no decision had, of course, been made, that no doubt Soviet concerns about a Trojan Horse were at least partly genuine.

^{asked about}
 Kitz ~~raised the question of~~ the composition of "the crew."

"They're asking us to put people in those upholstered chairs. Which people? How do we decide? It'll probably have to be an international crew. How many Americans? How many Russians? Anybody else? We don't know what happens to those five people when they sit down in those chairs, but we want to have the best ^{men for the job.} ~~representatives we can.~~

Ellie

~~did not rise to the bait, and he continued.~~

"Now a major question is going to be who pays for what, who builds what, who's in charge of overall system integration. I think ~~we can~~ ^{this,} ~~it's possible to do some real horse trading on those points,~~ ^{in exchange} ~~for national~~ ^{ation} ~~against which nations are~~ represented in the crew."

"But we still want to send the best possible people," ~~Devries~~ ^{DerHeer} ~~interjected,~~ ^{noted, a little obviously.}

"Sure," returned Kitz. "but what do we mean by 'best'? Scientists? People with military intelligence backgrounds? Physical strength and endurance? Patriotism? (That's not a dirty word, you

know.) And then," he looked up from buttering another croissant to glance directly at Ellie, "there's the question of sex. Sexes, I mean. Do we send only men? If it's men and women, there has to be more of one sex than the other. There's five places, an odd number. Are all the crew members going to work together okay? If we go ahead

with this project, there's gonna be a lot of tough negotiation."

This isn't some ambassadorship you buy with a campaign contribution. This is serious business. Or is it?

"This doesn't sound right to me," said Ellie. "You want some

musclebound moron up there, some kid in his twenties who knows nothing about how the world works -- just how to run a respectable 100 yard dash, and how to obey orders? Or some political hack? That can't be what this trip is about."

"No, you're right," smiled Kitz. "I think ~~there are~~ *we'll find* people who satisfy all our criteria."

Der Heer,
~~DeVries~~, dark circles under his eyes, looking almost haggard, adjourned the meeting. He managed to give Ellie a small private smile, but it was all lips, no teeth. The Embassy limousines were waiting to take them back to the Elysee Palace.

* * * *

"I'll tell you why it would be better to send Russians, ~~than~~^{Americans} ~~Americans~~," Vaygay was saying. "When you were opening up your country -- pioneers, trappers, Indian scouts, all that -- you were unopposed, at least by anyone at your level of technology. You raced across your continent from the Atlantic to the Pacific, and you got to ~~expect~~ it would be easy. Our situation was different. We were conquered by the Mongols. Their horse technology was much superior to ours. When we expanded eastward we were careful. We never crossed the wilderness and expected it would be easy. We're more used to adversity than you are. And we're used to catching up ~~technologically~~. ^{Also, Americans are} You're used to being ahead technologically, almost without effort. ~~Well~~ Now, everybody on Earth is Russian. (You understand, I mean in our historical position.) This mission needs ~~Soviets~~ ^{Russians} more than it needs Americans."

They were seated at the same window table at Chez Dieux. There was a distinct chill in the air, a premonition of winter, and a young man wearing a long blue scarf as his only concession to the cold strode briskly past the tubs of chilled oysters outside the window. From Lunacharsky's continuing (and uncharacteristically) guarded remarks, she deduced disarray in the Soviet delegation. The Soviets were concerned that the Machine might somehow redound to the ^{strategic} advantage of the United States, in the five-decade ^{- old} global competition. Vaygay ^{in fact} had been shocked by Baruda's question about burning the data and ^{He had had little advance knowledge of Baruda's position.} destroying the radio telescopes. The Soviets had played a vital role

in gathering the Message, with the largest longitude coverage of any nation, Vaygay stressed, and had the only ocean-going radio telescopes. They would expect a major role in whatever came next. Ellie assured him that, as far as she was concerned, they should have such a role.

"Look, Vaygay, they know from our television transmissions that the Earth rotates, and that there are many different nations. The Olympic broadcast alone might have told them that. Subsequent transmissions from other nations would have nailed it down. So they could have phased the transmission with the Earth's rotation, so only one nation got the Message. They chose not to do that. They want the Message to be received by everybody on the planet. They're expecting the Machine ~~also~~ to be built by the whole planet. This can't be an all-American or an all-Russian project. *It's not what our...client wants."*

But she was not sure, she told him, that she would be playing any role in decisions on machine construction or crew selection. She was returning to the United States the next day, mainly to get on top of *new radio* the data from the past few weeks. The Consortium Plenary sessions seemed interminable, and no closing date had been set. Vaygay had been asked by his people to stay on at least a little longer. The Minister of Foreign Affairs had just arrived and was now leading the Soviet delegation.

"I'm worried ~~that~~ all this will end badly," he said. "There are so many things that can go wrong, ~~so many possible single-point failures~~. Technological failures. Political failures. Human failures. But even if we get through all that, if we don't have a war because of the Machine, if we build it correctly and without blowing ourselves up, I'm still worried."

"About what? How do you mean?"

"The best that can happen is we will be made fools of."

"Who will?"

"Arroway, don't you understand?" A vein in Lunacharsky's neck throbbed ~~slightly~~. "I'm amazed you don't see it. The Earth is a ghetto. . . yes, a ghetto." He seemed to be savoring the word. "All human beings are trapped here. We have heard vaguely that there are big cities out there beyond the ghetto, with broad boulevards filled with droschkys [CHECK.] and beautiful perfumed women in furs. But the cities are too far away, and we are too poor ever to go there, even the richest of us. Anyway, we know they don't want us. That's why they've left us in this pitiful little village in the first place."

"And now along comes an invitation. As Xi said. Fancy, elegant. They have sent us an engraved card and an empty droschky. We are to send five villagers and the droschky will carry them to -- who knows? -- Warsaw. Or Moscow. Maybe even Paris. Of course, some are tempted to go. There will always be villagers who are flattered by the invitation, or ^{who} think it is a way to escape our dirty village."

"And what do you think will happen when we get there? Do you think the Grand Duke will have us to dinner? Will the President of the Academy ask us interesting questions about daily life in our filthy Stetl? Do you imagine the Russian Orthodox Metropolitan will engage us in learned discourse on comparative religion?

"No, Arroway, we will gawk at the big city, and they will laugh at us behind their hands. They will exhibit us to the curious. The more backward we are, the better they'll feel, the more reassured they'll be.

"It's a quota system. Every few centuries, five of us get to spend a weekend on Vega. Have pity on the provincials, and make sure they know ~~where the power really lies.~~ who their betters are."

Chap. 13

Carl ✓

18 October, 1984

BABYLON

~~Argus~~ ^{Copy 21} main frame computer ^{at Argus} had been instructed to compare each day's harvest of data from Vega with the ~~the~~ earliest records of Level 3 of the palimpsest. In effect, one long and incomprehensible sequence of zeros and ones was being compared automatically with another, earlier, ~~such~~ sequence. This was part of a massive statistical intercomparison of various segments of the still undecrypted text. There were some sequences of zeros and ones -- "words" some of the analysts called them, hopefully -- which were repeated again and again. ~~Other~~ ^{Many} sequences would appear once only in thousands of pages of text. This statistical approach to message decryption was familiar to Ellie since high school. But the subroutines supplied by the experts from the National Security Agency -- ~~after certain changes~~ ^{made available} ~~were made, and~~ ^{and even then armored with codes to self-destruct if examined closely} -- were brilliant. What prodigies of human inventiveness, Ellie reflected, were being directed to the global confrontation between the United States and the Soviet Union, now, to be sure, easing somewhat. It was not just the financial resources ~~being~~ dedicated to the military establishments of all nations. That was approaching two trillion dollars a year, and by itself was ruinously ~~foolish~~ ^{expensive} when there were so many other urgent human needs. But still worse, she thought, was the intellectual effort ~~being~~ dedicated to the arms race. More than half the scientists on the planet, it had been estimated, were employed by

Occasionally, the ^{pur} motivations were political, tracing back to the arcana of international relations or national propaganda many decades earlier. Many of these scientists had real talent, whatever reservations Ellie might have about their motivations. Page 13/2

almost ~~various~~ ^{worldwide} military establishments. And they were not only the dregs of the doctoral programs in physics and mathematics, ~~as~~ ^{with this thought} Some of her colleagues would console themselves when the awkward problem arose of what to tell a recent doctoral candidate being courted by, say, one of the weapons laboratories. "If he was any good, he'd be offered at least an assistant professorship at Stanford," she could recall Drumlin once saying. No, a certain kind of mind and character was drawn to the military applications of

science and mathematics -- ^{to avenge some schoolyard injustice} people who liked big explosions, for example; ^{or inveterate puzzle-solvers who longed} and people who wanted to decrypt the most complex messages of

intelligent origin up to then known. Once the limited edition Cray 21 computer had been introduced into Argus (cooled with the products of the facility's own liquid helium production plant), the specially redesigned NSA programs came on line and began spewing out elaborate statistical correlations. They would be very useful once the primer was received, or the Message otherwise began to unravel. She pored ^{that had accumulated during her absence.} over the analyses. There was a particular sequence of 137 zeros and ones that appeared uncommonly often for ^{its length.} ~~the size of the word(s).~~ Why don't they simply abbreviate it? she wondered. ^{or words} But this word appeared on none of the diagrammatic pages. It was, like so much else of the Message, mysterious.

She wished there had been someone -- especially a close woman friend -- at Argus to whom she could pour out her hurt and anger at

~~how~~ Ken's ^{behavior.} ~~had treated her.~~ But there were not, and she was disinclined even to use the telephone for this purpose. She did manage to spend a weekend with her college friend, Becky Ellenbogen, in Austin, but Becky -- whose appraisals of men ^{tended} ~~were generally~~ somewhere between wry and scathing -- in this case was unexpectedly mild in her criticism. [¶] "He is the President's Science Advisor, and this is only the most amazing discovery in the history of the world. Don't be so hard on him. He'll come around," Becky urged. [¶] But Becky was another of those who found Ken "charming" (she had met him once at the dedication of the National Neutrino Observatory), and ^{perhaps} ~~was too~~ inclined to accommodate to power. Had ^{Der Heer} ~~DeVries~~ treated Ellie in this shabby way while ^{he} ~~DeVries~~ was a mere professor of molecular biology somewhere, Becky would have marinated and skewered the man.

After returning from Paris, ^{Der Heer} ~~DeVries~~ had mustered a regular campaign of apology and devotion. He had been overstressed, overwhelmed with a range of responsibilities including difficult ^{issues.} ~~and unfamiliar~~ political ~~novelties~~. His position as leader of the American delegation and co-chairman of the Plenary might have been rendered less effective if there had been public knowledge of his and Ellie's relationship. Kitz had been insufferable. Ken had too many consecutive nights with only a few hours' sleep. Altogether, Ellie judged, there were too many explanations.

Until she complained of the ^{extravagance,} ~~excess~~, there were flowers every day, including a new genetically engineered variety of black rose with scarlet piping. She wondered whether he ~~or some factotum~~ had made the arrangements with the local florist. ^{Contingency Task Group,} ~~Before a meeting of the Special Operations Executive [CHECK]~~ he presented her with an exquisite ^{custom-crafted} ~~piece~~ ~~of jewelry,~~ a golden pin in the shape of a lyre, with a ruby off-center in the position of Vega in the constellation ~~Lyra~~. Unlike her maser gems, the ruby was flawless. To please him she ^{pinned} ~~put~~ it on her blouse, but it felt a little as if she was in high school and had in this way publically accepted DeVries' invitation to go steady. The President, who generally, for political reasons, made a practice of ignoring nuances of adornment, made a special point of complimenting Ellie on the piece. And indeed, the lyre and the radiotelescope had in the past year become visual symbols whose meaning was recognizable instantly among widely diverse cultures all over the planet.

She permitted the relationship to continue. Ken was ardent and anxious to please. But there was a new impediment to her love, beyond wounded pride. It was like the ravishing young woman who wonders whether her admirers see anything beyond her physical appearance. In the back of her mind, still unacknowledged, Ellie was beginning to wonder whether Ken's interest in her was mainly job-related.

When it happened, it was Willie, on the graveyard shift, who first noticed it. Afterwards, Willie would attribute the speed of the

discovery less to the superconducting computer and the NSA programs,
^{than} ~~as~~ ^{Hadden} to the new ~~Logan~~ context recognition chips. At any rate, Vega was
 low in the sky an hour or so before dawn when the computer triggered an
 muted and understated alarm. Willie put down what he was reading ~~with~~
^{With} some annoyance, -- it was a new textbook on Fast Fourier Transform
 Spectroscopy -- and noticed these words being printed out on the
 screen:

41617-41620:

"RPT TEXT PP. 00000-00000. BIT MISMATCH 0/2271." Correlation

coefficient 0.0099+."

^{As he watched, 41619 became 41620 and then 41621. The digits after the solidus}
 Both the number of pages and the correlation coefficient, a ^{were increasing}
^{in a continuous}
^{blur.}

measure of the improbability that the correlation was by chance,
 increased as he watched. He gave it another two pages before picking
 up the direct line to Ellie's apartment. ^{She had been in a deep sleep}
^{ordered the bedside light on} and was momentarily disoriented. But she quickly oriented herself and
^{For} crisply gave instructions ~~for Willie to call~~ senior Argus facility
^{to be assembled-} staff. She would, she told him, locate ^{Der Heer} Devries who was somewhere on
^{proved to be very} the facility. This was not difficult. She shook his shoulder
 vigorously.

"Ken, get up. There's word that we've repeated."

"Wha?"

"The Message has cycled back. Or at least that's what Willie
 says. I'm on my way there. Why don't you wait another ten minutes so
 we can pretend you were ⁱⁿ ~~at~~ your room in ~~the~~ BSQ⁷."

She was almost at the door before he shouted after her, "How can we recycle? We haven't gotten the primer yet."

Racing across the screens was a paired sequence of zeros and ones, a real-time comparison of the data just being received and the data from an early page of text received at Argus a year before. The program would have ^ucalled out any differences. ~~There were~~ ^{So far,} none. It reassured them ~~greatly~~ ^{no apparent} that they had not mistranscribed, that there were ~~few~~ ^{and if} transmission errors, that some small ^{dense} interstellar cloud between Vega and the Earth ^{was able to} had not preferentially eaten the ^{this was an infrequent occurrence.} equivalent of an occasional zero or one, Argus was by now in real time communication with ~~the~~ dozens of other telescopes that were part of the World Message Consortium and the news of recycling was passed ^{the next observing stations westward, in to} on to California, Hawaii, the Akademik Keldysh in the South Pacific, and to ~~Sydney~~.

Continued on Page

1 February, 1984

JA
INSERT FOR CH. ~~14~~ 13

INSERT INTO CHAPTER ~~14~~ 13 IN THE DISCUSSION BETWEEN HADDEN AND ELLIE:

"No, I want to find the primer fast. We don't know that it will be waiting for us forever. If they hang up because there was no answer, it would be much worse than if they had never called at all."
